Centricity® Perinatal

Quantitative Sentinel Service Manual

2002033-023 Revision E

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CAUTION: In the United States of America, Federal Law restricts this device to sale by or on the order of a physician.

The information in this manual only applies to the most current Quantitative Sentinel application available as of the revision date of this publication. Specifications in this manual are subject to change without notice. Contact GE Medical Systems *Information Technologies* for the most current information.

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This manual is intended for clinical professionals. Clinical professionals are expected to know the medical procedures, practices and terminology required to monitor patients. Operation of the product should neither circumvent nor take precedence over required patient care, nor should it impede the human intervention of attending nurses, physicians or other medical personnel in a manner that would have a negative impact on patient health.

All illustrations are provided as examples only. Your product features and configuration may be different than those shown. Names of persons, institutions and places and related information are fictitious; any similarity to actual persons, entities or places is purely coincidental.

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AirStrip OB® is a registered trademark of MP4 Solutions, LP.

CE Marking Information

Compliance

The Quantitative Sentinel (QS) product bears the CE Mark

indicating its conformity with the provisions of the Council Directive 93/42/EEC concerning medical devices and fulfills the essential requirements of Annex I of this directive.

Exceptions

Users should be aware of known RF sources, such as radio or TV stations and hand-held or mobile two-way radios, and consider them when installing a medical device or system.

Be aware that adding accessories or components, or modifying the medical device or system may degrade its EMI (electromagnetic interference) characteristics. Consult with qualified personnel regarding changes to the system configuration.

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Preface

This section includes general information for this document.

What do you want to learn about?

- Document Information (page xv)
- Typographic Conventions (page xviii)
- Intended Use (page xix)
- Safety Information (page xx)
- Service Information (page xxiv)

Document Information

This section describes how this manual is organized.

What do you want to learn about?

- Revision history (page xv)
- Chapter contents (page xvi)
- Referenced documentation (page xvii)
- Related documentation (page xvii)

Revision history

The bottom of each page includes the title of the publication, the part number, and the revision letter of the publication. Use the revision letter to identify which version of the document you are reading.

The revision history of this document is summarized in the following table.

Table 1: Revision History

Revision	Date	Software Version	Comment
A	March 2003	6.60.0	Initial release.
B	March 2005	6.70.0	Updated for new release—includes addition of index.
C	July 2005	6.70.1	Added the System Failover chapter and made minor changes.

Table 1: Revision History

Revision	Date	Software Version	Comment
D	October 2005	6.70.5	Updated for new release—includes addition of Anti-Virus Software Policy, Security Patches Policy and Database Maintenance information. Used for the Pilot.
E	January 2006	6.70.5	Added Citrix Support appendix and updated the Preface.

Chapter contents

This document is organized into several chapters. These sections are described in the Section Contents table.

Table 2: Section Contents

Name	Contents
Chapter 1: QS System Overview	Describes the QS system, it's function, features, processes, and archeteciture. Also describes the user interface facilities, utility programs and tools.
Chapter 2: Process Control & Status	Describes QS processes and process arguments.
Chapter 3: Network Architecture	Describes the two types of networks necessary for communication between QS servers and clients and the QS Patient Monitoring System (PMS).
Chapter 4: Software Considerations	Describes software installation and upgrades.
Chapter 5: Preventive Maintenance	Describes the cleaning and periodic servicing of the 3rd party equipment that hosts and supports the operation of the QS system.
Chapter 6: Data Backup	Describes the importance of having a data backup application.
Chapter 7: System Failover	Describes backup servers and the failover process for single and cluster servers.

Table 2: Section Contents

Name	Contents
Chapter 8: Disaster Recovery	Describes the requirements for disaster recovery, as well as how to set up the environment for disaster recovery and then how to recover from a disaster.
Appendix A: Glossary of Network Terms	List of terms used to describe a network.
Appendix B: Sample Network Diagrams	Illustrates a collection of diagrams represents but a small number of the network configurations that are possible in the QS.
Appendix C: Fetal Monitor Set-Up	Describes information necessary for interfacing fetal monitors with the QS.
Appendix D: Unity Parameters	Provides parameter descriptions and the identity of the corresponding QS PMS items.
Appendix E: QS Versions	Describes the various versions of the QS system and the operating systems that support them.
Appendix F: QS & Other Documents	Lists a number of additional publications that may help you in understanding and supporting the QS system.

Referenced documentation

There are no referenced documentation in this manual.

Related documentation

The following documents are related to this manual.

NOTE: These manuals will only be available if the software that they document has been installed at your facility.

- *Centricity Perinatal Customer-Supplied Equipment Guide*, 2002033-045
- 6.70.5 Release Notes
- *AirStrip OB® System Administration Guide*
- *AirStrip OB® User's Guide*

Quantitative Sentinel® interfaces with AirStrip OB, a third-party software application that allows obstetricians to remotely view maternal and fetal information in virtual real time. To get more information on AirStrip OB, contact MP4 Solutions, LP. To find out how to install or upgrade QS with AirStrip OB, contact your GE Healthcare representative.

Typographic Conventions

The typographic styles used to ensure reader comprehension are described in this section.

What do you want to learn about?

- Messages (page xviii)
- Single step convention (page xix)
- Type conventions (page xix)

Messages

The following are the message conventions for this manual. Instead of an actual message, each one describes what type of information will be within each message type.

DANGER: Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury. Methods to avoid the hazard will be included.

WARNING: Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury. This includes serious adverse reactions, or limitations in use. Steps that should be taken to avoid or minimize the hazard will be included.

CAUTION: Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or to describe recommended practices for the safe and effective use of the device.

NOTE: Provides additional user information about the preceding step or information. It does not pertain to hazards.

TIP: Provides extra information about a procedure, such as a shortcut or an alternative method to complete a task.

Single step convention

The following example illustrates the convention for a single step. Other conventions used within this document are shown in the Type Convention Definitions table.

- To print the example and close the dialog box, click **OK**.

Type conventions

There are times when a different typeface is used in this documentation. The following table describes these typefaces and when they are used.

Table 3: Type Convention Definitions

Convention	Description
Sans-serif bold type	The information in bold sans-serif type refers to a component name on the screen. For example, click **OK** refers to the OK button on the dialog box.
SANS-SERIF SMALL CAPS	Keys that you press on the keyboard are displayed in this font. For example, press ENTER refers to the Enter key on the keyboard.
`Monospace type`	Information that you type on the keyboard is displayed in this font. Examples of code (software source code) are displayed in monospace font also.
`Monospace italics type`	In software source code examples, monospace italics are used for code comments.
Italic type	Information in italics is used when discussing a variable. Any font style, excluding the monospace styles, can be italicized for this purpose.

Intended Use

The Quantitative Sentinel (QS) System's is intended for automatic patient data management. It does this by:

- Providing the user the ability to create and use electronic forms for entering, viewing and storing patient and facility related data (e.g. charts, forms, graphs, chalkboards, care plans, user reference manual).
- Interfacing with other hospital information systems and medical devices for automatic data acquisition, viewing and storage with the electronic patient record.
- Providing visual notification of when acquired fetal monitor heart rate values exceed the user defined limits for high and low fetal heart rate and poor signal quality.

- Providing Spectra Alerts capabilities for fetal monitoring (surveillance).
- Providing automatic computations of physiologic indexes (e.g. nutrition).
- Providing calculations from user defined formulas (i.e. index calculator).
- Providing the ability to record, with the patient record, fluid input and output information that is defined by the user.
- Providing the ability to export patient data to relational databases for research and Quality Assurance purposes.
- Providing the ability to archive files to a secondary or tertiary storage medium (i.e. optical disk).
- Providing the ability to print (locally or remotely) patient records and QS database definition (e.g. item names).
- Providing the ability to review fetal monitor data (OB-Link) remotely over the Internet.

Safety Information

Warnings, cautions, and notes that are generally applicable to the Centricity CIS modules are summarized as follows.

What do you want to learn about?

- Potential Electrical/Mechanical/Physical Hazards (page xx)
- Internet and intranet considerations (page xxii)
- Surveillance and monitoring concerns (page xxii)
- Erroneous data entry and calculations (page xxii)
- Auto-logoff and message boxes (page xxiii)
- Security considerations (page xxiv)

Potential Electrical/Mechanical/Physical Hazards

Changes or modification to this device/system not expressly approved by GE Medical System may cause electromagnetic compatibility (EMC) issues with this or other equipment. This device/system is designed and tested to comply with applicable standards and regulations regarding EMC and needs to be installed and put into service according to the EMC information stated as follows.

CAUTION: Use of known RF sources, such as cell/portable phones, or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation of this device/system. Consult qualified personnel regarding device/system configuration.

CAUTION: The device/system should not be used adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, the device/system should be tested to verify normal operation in the configuration in which it is being used. Consult qualified personnel regarding device/system configuration.

CAUTION: The use of accessories, transducers and cables other than those specified may result in increased emissions or decreased immunity performance (a test standard to confirm that industrial equipment meets power quality and voltage sag ride-through requirements) of the device/system.

WARNING: ELECTRICAL SHOCK HAZARD—Do not operate equipment when moisture or liquids are present on any equipment surface.

WARNING: FIRE HAZARD—Do not operate electrical/electronic devices such as computer workstations, power supplies, and so forth within enclosed spaces. Sufficient ventilation must be maintained if these devices are to operate properly, realize their advertised service lives, and not overheat or catch fire.

WARNING: FIRE HAZARD—Adequate cooling of electrical/electronic devices such as computer workstations, power supplies, and so forth require unrestricted air flow to operate properly, realize their advertised service lives, and not overheat or catch fire. Cooling vents and fan openings should be periodically inspected for signs of debris buildup (lint, dust, and so forth) and cleaned/vacuumed whenever buildup is observed.

DANGER: EXPLOSIVE HAZARD—Do not operate equipment in the presence of flammable anesthetics or inside an oxygenated environment. The potential for fire or explosion could leave users with no warning and time to escape.

WARNING: INFECTION HAZARD—Do not omit QS equipment from established cleaning and disinfecting procedures appropriate for the environments at your facility. Failure to do so could expose patients and staff members to unnecessary risk of infection.

CAUTION: CONDENSATION HAZARD—Do not operate equipment recently subjected to environmental variations in temperature and humidity. The potential for accumulation of internal condensation could result in equipment damage.

CAUTION: Disposal HAZARD—Do not dispose of equipment in unsorted municipal waste.

This symbol indicates that the waste of electrical and electronic equipment must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

Internet and intranet considerations

WARNING: Data Accuracy—Users should always verify clinical data retrieved from (provided by) Internet or intranet sites accessed via the GE Medical Systems *Information Technologies* QS URL capability. The content or operation of the various displays (for example, pages) is the responsibility of the authors of the individual Internet or intranet sites.

WARNING: GE Medical Systems *Information Technologies* neither guarantees nor assumes any responsibility for the content of the displays provided by individual sites or the accuracy of the information that they provide.

Surveillance and monitoring concerns

CAUTION: DATA INTERPRETATION—Users should be aware of the operational characteristics of QS Fetal Surveillance Alerts (Hi/Lo Notifications & Spectra). Users should familiarize themselves with the audio/visual indications associated with the alerts feature employed at their site prior to use—refer to the ***FHR Notifications Guidelines*** or ***Spectra Alerts - Overview*** information sheets. Failure to review this material could result in misinterpretation of fetal (maternal) conditions.

CAUTION: MONITOR DIFFERENCES—Users should be aware of fetal monitor characteristics as they are interpreted for display by the QS system. In general, *thick lines on the paper strip* correspond to ‘red’ lines on the QS strip; while, *thin lines on the paper strip* correspond to ‘black’ lines on the QS strip. Users at institutions using fetal monitors from different manufacturers should be aware of this QS operational characteristic.

NOTE: TIME SYNCHRONIZATION—Users and members of the Biomedical Engineering staff should be aware that the time on the monitor must be synchronized with the time on the QS. Time synchronization between all devices and QS workstations (servers and clients) is critical. Anomalies will result if synchronization is not maintained. The user may see anomalies such as:

- Charting irregularities with the recorded time of clinical data entry (modify time).
- Fetal strips that restart when workstation displays are refreshed.
- PDATS (QS patient data server) exhibits storage errors.
- Monitored data is not stored when special procedures (non-invasive blood pressure and cardiac output) are performed.

Erroneous data entry and calculations

NOTE: Data Computation—The Centricity CIS modules may compute data values based upon data entered by the clinical practitioner and the formulas provided by the System

Administrator. Failure to ensure (1) accurate data entry and (2) correct formula definition could result in the generation of inaccurate computations.

NOTE: Data Entry—Be sure that the desired patient is selected before performing data entry. Failure to make the desired patient the focal point of data operations could result in the data being placed into another patient file.

NOTE: Drug Computations—Clinical users must ensure that correct data values are entered for the QS Compute function. Failure to comply with this requirement could result in an incorrect recommendation of drug rate or dose.

NOTE: File Merging—Although the patient merge mechanism is a relatively simple process, the clinical user must pay close attention to (1) patient selection and (2) data sources for each of the indicated data items. Failure to comply with this direction could result in an output file containing data from inappropriate sources (patients).

NOTE: Multiple Patients—Clinical users should be aware that multiple patients can be assigned to the same bed if a patient location dialog box (used for admission, discharge, and transfer functions) is open, and another user or process (such as an ADT interface) makes an assignment to the same bed prior to that dialog box being closed. Failure to observe/correct this situation result in data being placed into the wrong patient file. For this reason, you should verify patient location (via the QS roster display) after a transfer, admission, or discharge. If multiple patients are listed for a bed, you should either relocate the incorrectly placed patient or merge the patient files if the situation resulted from a single patient having been assigned an erroneous ID.

NOTE: Patient Identification—Be sure that the patient who previously occupied a specific bed has been discharged (placed in a unit Hold bed) before recording/monitoring data on the next patient placed in that bed. Failure to conform to this requirement could result in data being placed into the wrong patient file.

NOTE: Typographical Errors—Although the Centricity CIS modules may be configured to ensure that numeric data (for example, pulse, BP, or temperature) is within a specified range of acceptability, users may make typographical errors when entering data. Failure to verify your manually entered data could result in the storage of incorrect data.

Auto-logoff and message boxes

WARNING: If a message is displayed when the system auto-logs off, when a user next logs in (regardless of whether it is the same or a different user), the message will still be displayed. However, when the message box is dismissed by the user a grey screen is displayed and the user must exit the system to continue.

Security considerations

NOTE: System Security—The Centricity CIS system provides the capability to define the degree of user access to workstations through the use of IDs and passwords. It also allows the assignment of READ/WRITE privileges via security objects to determine who may access or record patient data. Failure to properly configure the security feature could result in unauthorized personnel gaining entry into Centricity and ultimately viewing or recording patient data.

Service Information

If you need help with the Centricity CIS modules or want to speak with customer support, call the applicable number from the following table, and one of our representatives will assist you.

Table 4: Customer Support Phone Numbers

Area	Phone Number
Within US	1-800-433-2009
Outside US	+49 761 4543-600

Introduction to the Quantitative Sentinel (QS) System

The QS Clinical Information System (CIS) is designed to automate record keeping in medical facilities such as intensive care units (ICUs), operating rooms (ORs), obstetrical/gynecological (OB/GYN) units, and units operating on the general floor. The QS Designer enables individual medical organizations to easily configure their systems to meet specific data management requirements without the assistance of experienced medical programmers. Use of the QS Designer should be limited to the institution's assigned System Manager(s).

User Interface

The Microsoft's Windows® operating system provides the user interface for the QS system. This interface allows the use of function keys, icons, and menus to facilitate user direction of system operations. Scrollable windows provide access to the various screen displays and user dialog boxes necessary for data entry, storage, and retrieval. User interaction with the QS system may be accomplished through a variety of devices such as keyboards, mouse devices, and trackballs.

Interface Customization

System Managers may customize the operation of the QS system to meet the specialized needs of different clinical users. This is accomplished through the definition of Views that exhibit unique display formats, specialized collections of charts and forms, and so on. View definition also allows the System Manager to provide specific forms of navigation (toolbars, menus, tab control navigators, and function keys) through the QS system that are specifically tailored to meet the needs of individual user groups. Users who have a wide range of responsibilities may be assigned multiple views; this will allow selection of the view best suited for the clinical environment in which they are functioning at any point in time. Views may be defined for environments such as operating rooms, intensive care units, labor and delivery units, neonatal intensive care units, and so on. As user experience and expertise grow, you should solicit their inputs about special clinical needs (new or modified charts, forms, function key assignments, and so forth) so that you may better refine the operational capabilities of currently defined view(s) and create new ones as the need presents itself.

Supported Interfaces

The QS system employs Microsoft- and IBM-supported software architectural standards, an IBM-compatible microcomputer platform, and standard off-the-shelf network hardware and software products. Adherence to industry standards allows the QS system to easily connect to and acquire data from existing hospital information systems (HIS) and laboratory information systems (LIS).

User Background

The intended users of this manual are facility staff members who have been tasked with maintaining the operation of the QS system. This manual should be mandatory reading for all QS System Managers, placed in a convenient location to facilitate its use as a reference, and employed as orientation material for prospective QS System Managers.

Disclaimers

The following disclaimers clarify the intent of this manual's content and the manner of its presentation. These statements address system operational considerations, design changes, reproduction rights, and the use of patient data as defined in the paragraphs that follow.

What would you like to learn about?

Customer Responsibility for Medical Record (page xxvi)

Data Collection (page xxvi)
Design Changes (page xxvi)
Patient Care (page xxvi)
References to Persons, Places, and Institutions (page xxvi)
Reproduction Rights (page xxvii)

Customer Responsibility for Medical Record

Customers are responsible for determining the form, type, and presentation of the data and documentation that will constitute the official patient medical record. The QS system enables customers to configure the type of data captured and the electronic and printed displays of data. It is the customers' responsibility to become familiar with the features of the system in order to make informed decisions about the data, processes, media, and formats that they may choose to capture, extract, archive, and display for the purposes of an official medical record.

Data Collection

The QS system is not intended to replace the patient information obtained from patient monitoring equipment with which it is interfaced; rather, it should be employed as a supplemental device that allows the clinical staff to enter, store, retrieve, and view data in a more efficient yet flexible manner.

Design Changes

Due to design changes associated with continuing product improvements, information in this manual is subject to change. GE reserves the right to change software design at any time and any such changes could affect the contents of this manual. GE assumes no responsibility for any errors or inconsistencies appearing in this manual that result from product design changes and upgrades.

Patient Care

Operation of the QS should neither circumvent nor take precedence over required patient care, nor should it impede the human intervention of attending nurses, physicians, or other medical personnel in a manner that would have a negative impact on patient health.

References to Persons, Places, and Institutions

References to persons, places, and institutions used within this manual are solely intended to facilitate user comprehension of the QS system's use and functions. Extreme care has been taken to use fictitious names and related information in the examples and illustrations provided herein. Any similarity of this data to persons

either living or dead and to either current or previously existing medical institutions should be regarded as coincidental.

Reproduction Rights

No part of this manual may be reproduced, stored in a retrieval system, or transmitted in any form or by any means—electronic, mechanical, photographic, and so on—without the prior written permission of the General Electric Company. All inquiries regarding this manual or the Centricity Perinatal Quantitative Sentinel System should be directed to GE.

Chapter 1: QS System Overview

QS System Description

The Centricity Perinatal Clinical Information System is a software application that operates on industry standard, off-the-shelf operating system software, and computer/network hardware. It is a form of application software commonly referred to as a clinical data management system or clinical information system.

Centricity® Perinatal addresses the needs of clinicians, information technologists, and risk managers in the Perinatal environment. It provides a complete electronic maternal-infant record that meets the demands of today's healthcare industry and provides a method to access each patient's records for over 21 years postpartum. Key features include one-time data entry and reporting, simplified regulatory compliance, enhanced IT connectivity, remote physician access, and the flexibility to configure the system to support the clinical practice of a specific facility.

Capabilities

The primary or general purpose of the QS system is to provide automated patient data entry. It accomplishes this by:

- Allowing creation and use of electronic charts and forms for entering, storing, retrieving, and viewing patient/facility related data (for example, charts, forms, and chalkboards).
- Interfacing with other hospital information systems and medical devices for select, automatic data acquisition, viewing and storage with the electronic patient record.
- Providing visual notification of when acquired fetal monitor heart rate values exceed the user defined limits for high and low fetal heart rate and poor signal quality.
- Providing Spectra Alerts capabilities for fetal monitoring (surveillance).
- Recording acquired fetal monitor data with patient record.
- Providing automatic computations of physiological indices.
- Providing calculations from user defined formulas.
- Providing the ability to record, with the patient record, fluid input and output information that is defined by the user.
- Providing the ability to export patient data to a relational database for research, reporting and quality assurance purposes.
- Providing the ability to archive files to a secondary or a tertiary storage medium.
- Providing the ability to print.

Intended Users of the QS

Intended users are nurses, nurse managers, physicians as well as other licensed care providers and trained/site authorized personnel with system configuration and maintenance responsibilities

User Environment

The QS is intended for use in a hospital or other clinical setting.

Patient Applicability

Access to the patient population is restricted to only those patients within units configured for use with the QS.

Users should note the following:

- The QS is not connected directly to any patient
- The QS is not intended to replace the patient information obtained from patient monitoring equipment with which it is interfaced
- Use of the QS should not circumvent or take precedence over required patient care

HIPAA Conformance

GE Medical Systems is aware that complying with the Health Insurance Portability and Accessibility Act (HIPAA) is a top priority as you work to meet transaction, security and privacy regulations. Because these new regulations are an important step forward in protecting patient's privacy and improving efficiency within the healthcare industry, GE is actively engaged in providing information to help you identify and resolve many of the patient care and business issues you may face as you implement actions to comply with HIPAA.

You are encouraged to access the Internet URL listed below for the most recent information about our commitment to HIPAA: Have your username and password ready to access the site.

http://www.gemedicalsystems.com/it_solutions/hipaa/statement.html

QS Features

The following paragraphs describe available QS features. Please note that some features are optional and only available if specifically purchased.

Manual Patient Data Recording

User will generally enter data via electronic charts, forms, and/or chalkboards using a computer keyboard. Although default charts, chalkboards and forms are provided for the QS, the QS Designer tool provides appropriately trained site personnel to create their own or modify duplicates of the default items to better suit the needs and requirements of their specific facility.

Clinically-related charts and forms may be combined into an appropriately labeled display group to allow users to access the complete complement of charts suitable for the clinical tasks for which they are responsible.

Charts

The chart is an electronic version of the traditional paper charts that clinicians once used to record patient information. QS charts appear on the computer workstation display monitor and generally take the form of tabular charts and flowsheets. Generally used to record recurrent data such as temperature, blood pressure, and so forth, QS charts provide the maximum amount of patient information within a given display.

Forms

Forms are generally used to record data that does not vary with time. Demographic information such as patient name, sex, date of birth, and so forth is well suited for collection/display by QS forms.

Chalkboard

Similar to the white-boards used within individual hospital units to display patient (bed) status, attending physician, lab results and other hospital defined information. The QS chalkboard offers the advantage of being periodically updated with the latest data within the patient record.

MAR

The Medication Administration Record (MAR) allows transcription of medication and fluid orders into the QS using dedicated displays and predefined order templates. Currently, there are four displays associated with the MAR—a MAR display, an I&O Summary display, an Interventions display, and an Order Summary display.

Automated Patient Data Recording

Patient data may be automatically acquired from other hospital information systems and/or devices that are interfaced with the QS system. The acquired data is automatically entered and saved with

the appropriate patient file(s) and may be subsequently retrieved for viewing within QS charts, forms and chalkboards. Automated data recording combined with manual data entry allows the QS to maintain a comprehensive patient record.

Hospital Information Systems (HISs)

Automated information transfer (receipt and transmission) is possible if the QS is networked with laboratory, ADT (admit, discharge and transfer), or other information systems. User-specified data is acquired from the respective system(s) and is generally unidirectional in that it travels from the HIS system to the QS database. In some configurations, equipped with the HL7 Outbound feature and/or Spacelabs Ultraview Gateway, the QS will serve as either the source of information or a request for information. The QS interface conforms to the HL7 standard - an application level specification for electronic data exchange in healthcare environments.

Devices

The QS is able to acquire data from physiologic monitors and bedside devices equipped with the ability to send data to another system (e.g. via RS-232 connection). Data flow is essentially unidirectional from the device to the QS (except for configurations making use of the Lab Access Server or Unity Time Synchronization). The QS provides no controls to the interfaced monitor or device. Device interfaces are consistent with the data transmission protocol established by the device manufacturer. These protocols are governed by industry standards for data transmission. The acquired data is in the form of parametric data (e.g. blood pressure values) or waveform data. Acquired data recorded within the electronic patient record is available for historical review as well as real-time surveillance capability (fetal monitor waveform data only).

Fetal Heart Rate (FHR) Notifications

Sites may choose to use either of two available forms of fetal surveillance.

FHR Notifications provide both visual and audible indications that a monitored fetal heart rate (FHR) is either above (high) or below (low) site/user defined limits or missing (poor signal quality). These indicators are based upon parameters acquired directly from the interfaced monitor.

Spectra Alerts analyze FHR and uterine activity (UA) using a set of sophisticated internal algorithms to determine the type and level of alert appropriate for the current fetal state. When appropriate, the QS will generate both visual and audible alerts appropriate for the evaluated fetal state.

Printing and Faxing

Patient information (e.g. tabular charts, flowsheets and forms) as well as system configuration data (used to define the QS operation as well as item, chart, and form definitions) may be printed either on receipt of a user initiated demand or in accordance with a predefined printing schedule. The printed output may be sent to any properly configured printer or fax machine.

Index Calculator

The index calculator permits users to enter formulas and perform mathematical and scientific calculations.

Compute

Compute consists of preset formulas that permit the user to perform nutrition, and drug related calculations. The formulas are based on known, published formulas.

Online Help

Online help allows users to access information about a particular QS operation or feature. This is similar to the Help feature in common software applications like Microsoft Word.

Security

Password, logon requirements, validation requirements and assigned service categories are defined by the site's System Manager(s).

Export

This feature permits the export of ASCII formatted patient data into a relational database (Microsoft Access) for quality assurance, reporting and research purposes. Operation of the relational database is separate from the QS system.

Archive

Archive permits patient data (files) to be permanently saved to an alternative storage medium (CD-R or a hard drive).

QS Architecture

Figure 1-1 shows the QS in the context of a typical hospital system. Healthcare providers interact with the user interface to review and modify patient data and system configuration data. ADT, Lab, and bedside fetal/physiological monitors send data to the QS, which incorporate it into the electronic patient record. OBLink, a Web-based application, and Airstrip OB, a PDA/Smartphone application, are solutions to deliver and display fetal trace data and other data to remote users through Microsoft Windows Internet Information Service (IIS). The Solar Lab Access (SLA) interface allows for laboratory results to be sent and displayed on the GEHC Solar 8000 and Dash 3000 monitors on the Unity network. Patient data can be stored on long-term storage media for future retrieval and may be exported to a third-party relational database for cross-patient analysis and reporting. Patient and system configuration data can be sent to printers either on demand or scheduled print jobs.

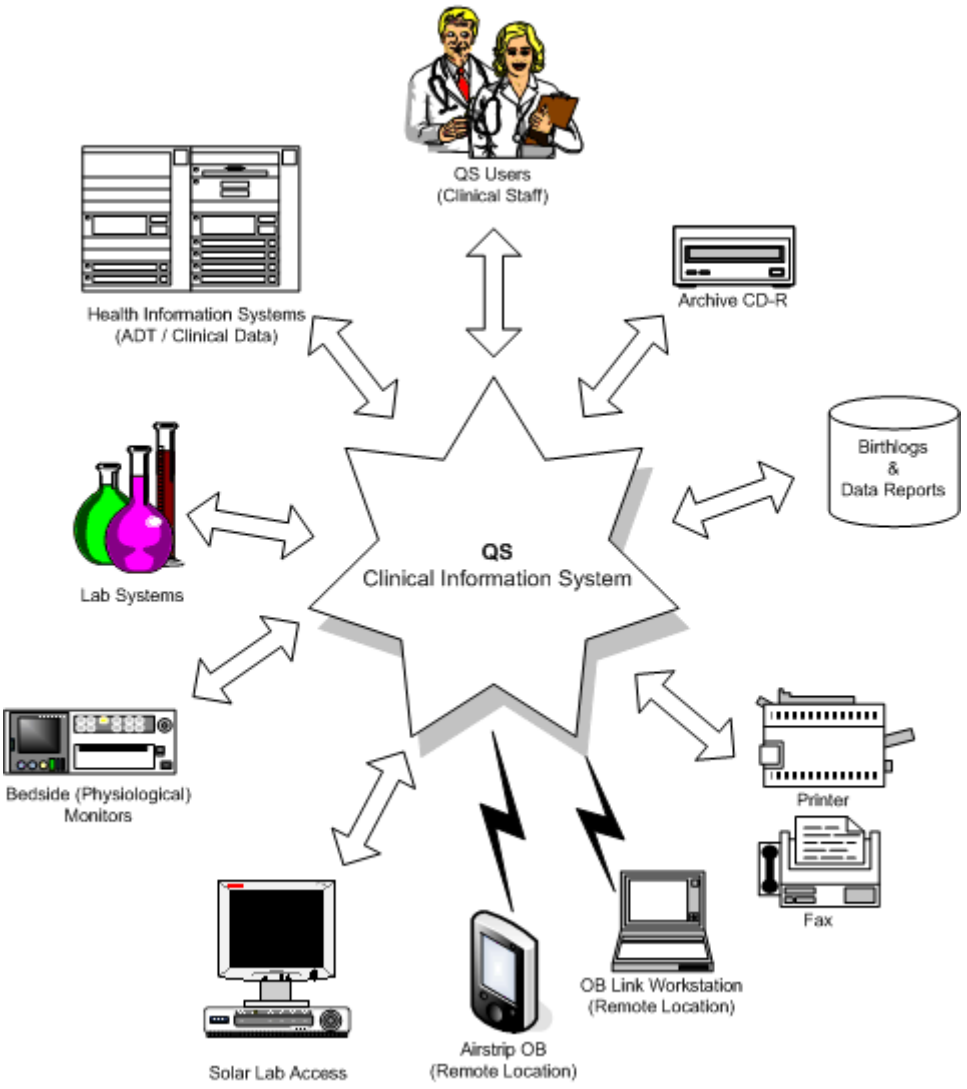


Figure 1-1: QS Context Diagram

The Solar Lab Access (SLA) interface allows for laboratory results to be sent to GEMS Solar 8000 or Dash 3000 monitors on the Unity network for display. Patient data can be stored on long-term storage media for future retrieval, and may be exported to a third-party database for cross-patient analysis. Patient and system configuration data can be sent to printers either on demand or through performance of scheduled print jobs.

Figure 1-2 shows the major patient data interactions in the QS.

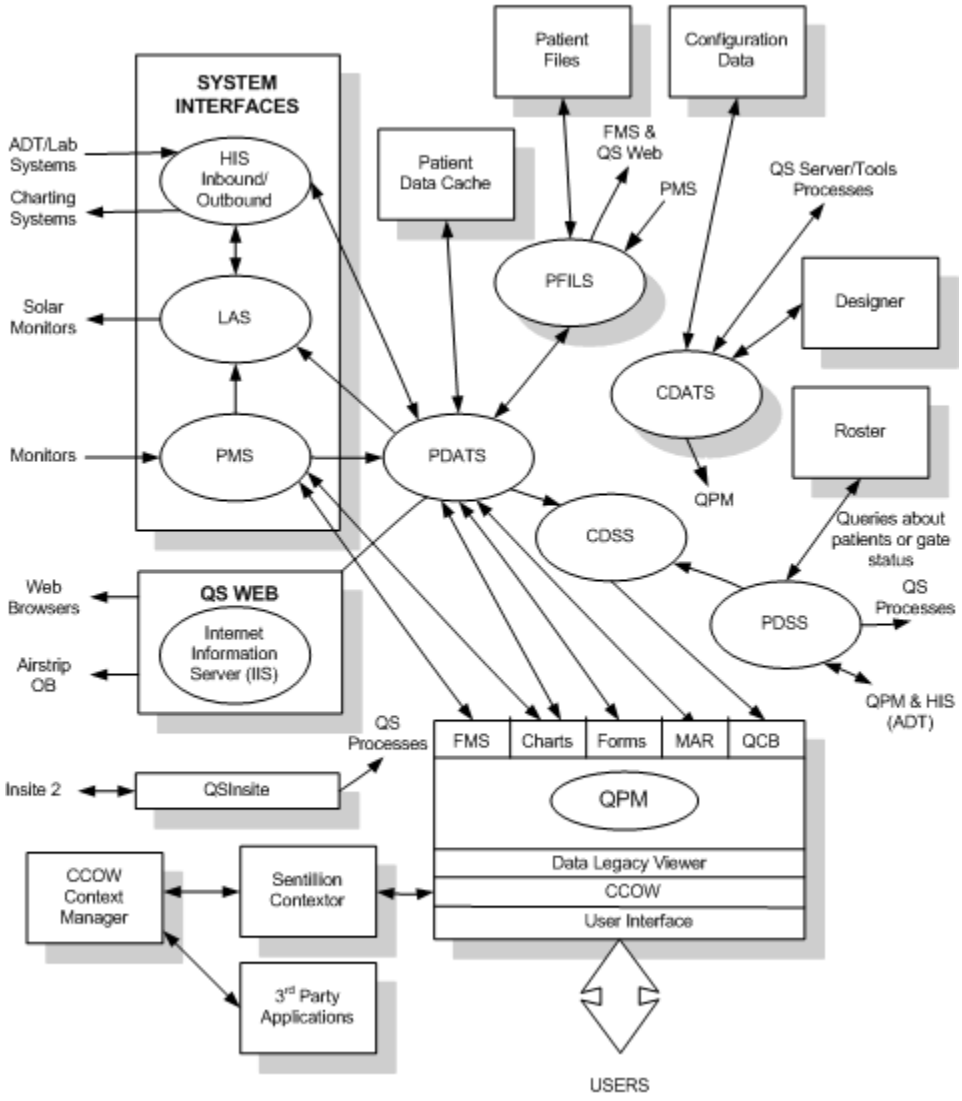


Figure 1-2: Major Patient Data Interactions within the QS

Patient data can be charted or reviewed via the primary user interface process, the QS Presentation Manager (QPM). QPM can present patient data in different formats. The Fetal Monitoring Surveillance (FMS) displays fetal wave data and allows users to annotate that data. The Chart interface presents patient data in a tabular chart. The Forms interface presents data in a graphical format. The QS Chalkboard (QCB) interface is an electronic version of chalkboards often found in hospitals at unit central

stations, displaying site defined patient data for each unit bed. The Chalkboard Data Services Server (CDSS) manages data that can be accessed via the chalkboard. The Medication Administration Record (MAR) provides the ability to order and chart medications, intake fluids, and output fluids.Patient data can also be received from external systems by the system interface process for the Hospital Information System (HIS Inbound) and Patient Monitoring System (PMS).

Patient data can be sent to external systems through:

- The QS Web server (OBLink\QSWeb) – allows fetal monitor data and other charted patient data to be sent via remote access, intranet, Internet for display in a secure Web browser on any workstation or via the Airstrip OB on a PDA or SmartPhone.
- The Lab Access Server (LAS) - makes lab data available to Solar 8000 monitors.
- The HIS Outbound Interface - sends configurable messages containing patient data either automatically or by user request using the HL7 standard.

Once data has been received by one of the interfaces, it is sent to a Patient File (PFIL) server for storage in the file being managed for that patient. Most data is also cached in memory for quick access by a Patient Data (PDAT) server.

The PDSS process keeps track of and manages the storage of patient data in memory and on the server's disk drive.

CDATS provides configuration data to all QS processes

Figure 1-3 depicts the ancillary QS processes which are vital to the operation of the QS, but which are not primarily responsible for the receipt and management of patient data. The centralized logging server (LOGS) writes system status and error messages to log files to assist in the maintenance of the QS system. The Scheduled Print Program (SPP) supports the printing of patient and configuration data via a scheduled batch job.

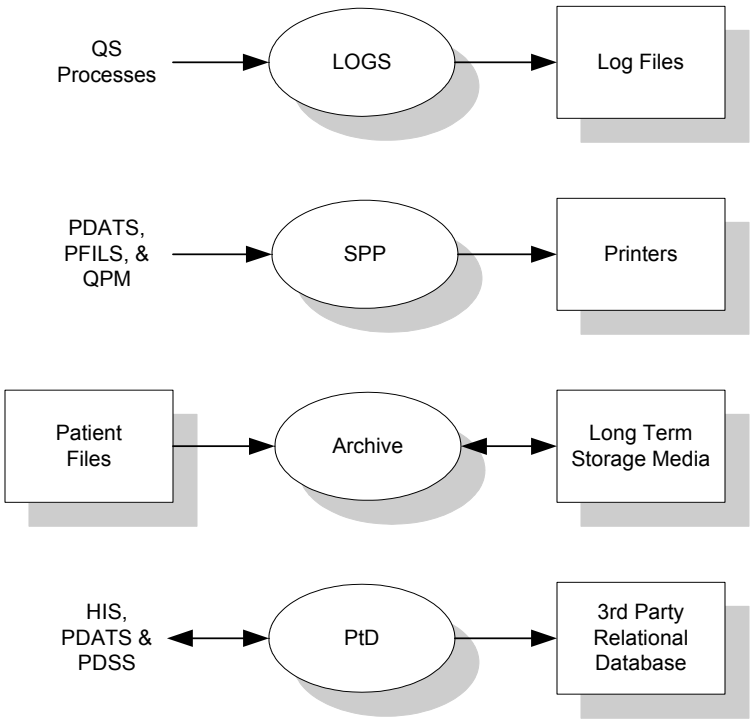


Figure 1-3: Ancillary QS Processes

The Archive server stores data from patient files to long term storage media. The Patient Data Daemon (PtD) supports on demand or scheduled requests to automatically record data, transfer patients, export patient data, backup patient files, and purge patients from the QS.

A more detailed description of the various QS processes follows in “Process Control & Status” on page 51.

SPP (Scheduled Print Program) supports scheduled print jobs. The schedules are entered via the QPM user interface, and are stored in the configuration data. SPP can be configured for up to 128 print jobs for different days of the week and starting times. Print requests are made via the QPM user interface using standard windows print queues.

PtD (Patient Data Daemon) supports on demand or scheduled requests to automatically record data, transfer patients, export patient data, backup patient files, and purge patients from the QS. PtD jobs are scheduled using the QPM user interface.

User Interface Facilities

QMI Presentation Manager (QPM) provides the major user interface for the QS. QPM interfaces with PDATS & PMS to support the reviewing or recording of patient data. QPM interfaces to PDSS to support ADT services. QPM may be run on any QS workstation, but is not usually run on the same machine as the QS

servers to improve performance. QPM can present data in five formats. These formats are described in the following paragraphs.

The Chart interface presents patient data in a flowsheet format that mirrors the traditional paper model in content and layout. The characteristics of QS charts are defined in the configuration data, and can be created and modified by the QS user.

The Forms interface is an alternative to the chart interface, providing a more graphical presentation of patient data. QS customers can create and modify forms using the Forms Designer.

The Fetal Monitoring Surveillance (FMS) format displays fetal monitor strip chart data and allows users to annotate the acquired data.

QS ChalkBoard (QCB) provides a bed-centric view of patients in the QS, unlike the Charts and Forms formats which provide a patient-centric view. QCB displays data for multiple patients simultaneously, updating dynamically as data changes without requiring the user to take any action to request a refresh. In normal operations QCB relies on CDSS to provide the information to be displayed on the chalkboard. If CDSS is not operational, QCB can receive the information it needs directly from PDATS and PDSS. For besides displaying patient data, QCB also supports modification of patient data and limited ADT services. QS customers can create their own chalkboard templates using the QCB Designer.

Medication Administration Record (MAR) provides the ability to order, record and view medication, infusion, intake and output fluid, and intervention orders for a patient. There is a mechanism to pre-configure the orders using the Designer. QPM allows the clinician to view, modify and activate orders for a patient. The chart interface for displaying medications (MAR) and fluids (I&O) allows for in-cell editing. MAR has an additional display (Order Summary) which displays all orders for a given patient.

The QPM provides a dialog box which allows the user to retrieve archived patient data. Search criteria can be used to locate a patient for restoration into the QS. The search criteria include patient ID, patient name, CD volume name, date archived, and three optional user defined items. Data can be restored from CD placed in the CD-ROM drive of the workstation running QPM, or from the staging area on the server if the patient file has not yet been written to CD. The patient will be restored into a hold bed of the configured restore unit unless the user chooses some other unit prior to initiating the restore. If a patient ID is currently being served in the QS, the user can specify an alternate patient ID for the patient to be restored.

Data Legacy solution provides a service to move one or more legacy QS databases and the associated patient records archived on CDs to a hard drive location. A separate user security system will be maintained to allow access to the Legacy Record Viewer (LRV). The LRV loads the merged index of all patient records and provides

a query capability to allow the user to select a patient record on a networked workstation to view and print the record in its entirety.

QS Processes

Operation of the QS is enhanced/augmented through the use of "mini-programs" that perform specific activities. Each of these processes is identified and described by the following paragraphs.

Archive

Archive stores data from patient files to a CD-R, a hard drive, or both. Data can be archived periodically or on demand. Archive maintains a database with information about every successful patient archive, which is used to support the subsequent retrieval of data from the long-term storage media.

The Archive database contains the following of information:

- Patient ID
- Patient Name
- Uncompressed Patient File Name
- Compressed Patient File Name
- Compressed Patient File Size
- Volume Name of the Compact Disc
- Last Value of up to Three User-Configurable Items

Archived patient files can be restored from a CD-R or hard drive on any QS workstation with a CD drive. The restore interface is available in the QPM application.

Before archiving the patient data, the patient files are compressed. The compressed file is written to two CD-R discs with the same volume name, or to a hard drive, or both.

- **Data files**: The Archive and Restore functions use an Access 2000 database to store information about patients that have been archived. The path to this database is `D:\qs\archive\NTArchive`. Please note that in NT configurations, the drive specification remains `E:`.
- **Log files**: The log files for Archive can be found in `\qs\logs\archive`. These files consist of two types of detail files—`ArchAdmi.xx` and `Archive.xx`. `ArchAdmi.xx` details the administrative activities affecting the process (for example, starting, stopping, and parameter changes) while `Archive.xx` details the activities and/or errors relating to the Archive process.

Broadcast Relay

The QS application uses a limited amount broadcast traffic for the real-time fetal monitoring network as well as certain other communications such as heart-beat messages. Since routers, by default, do not forward broadcast traffic, the QS system uses a process called Broadcast Relay (BRelay) to enable application functionality in multi-subnet installations.

BRelay forwards only selected QS specific broadcasts. For example, if a QS workstation were installed in the Medical Records department, it would not need to display the active fetal strips. In this case we would could configure BRelay to not send the PMS specific traffic (which is the majority of the broadcast traffic) to that network. This type of configuration assumes no other workstations in that subnet require the fetal monitoring broadcast communication.

BRelay is not enabled by default. When required, one QS workstation or server will be configured to run BRelay on each subnet. If a workstation is chosen to run the process it should be a machine that is never turned off or rebooted. If the BRelay workstation or server is shut down, the QS application will be affected and may become unusable until BRelay functionality is restored on that subnet.

- **Data files**: none
- **Log files**: The logs for BRelay can be found in `\qs\logs\brelay`. These files consist of a BRelay log that details process information.

CDATS

The Configuration Data Server (CDATS) application runs only once in a QS environment on a primary or load-share server. This application is responsible for managing and distributing the configuration information to and from other QS processes such as PDSS, PFILS, CDSS, LOGS, and so forth

CDATS contains the data dictionary that describes the patient data.

This configuration information is used to tailor the QS to the needs of a hospital site. Almost every QS process reads configuration data at startup, therefore CDATS is a critical part of the QS.

Configuration data is modified via the Designer application.

During system upgrades, the standalone CDUpdate utility is used to modify the configuration data to conform to the format used by the new QS version. CDATS runs a verification once a day.

- **Data files**: The configuration files (site tables) are found in the `\qs\site` directory on the machine running the CDATS process.
- **Log files**: The CDATS log files are found in `\qs\logs\cdats`. These files consist of the following:

`CDATS.xx` files (where xx is a number from 00 to 09) that detail the process function or errors

`CDATAdmi.xx` files that detail the administrative activities

`CDATUpda.xx` files which detail modifications to the configuration

`CDATVeri.xx` files which contain information about the verification process

CDSS

The Chalkboard Data Services Server (CDSS) application runs only once in a QS environment on a primary or load-share server. . This application is responsible for maintaining information about patient data items to appear on the electronic chalkboard and 'posting' those items to the chalkboard. This application usually runs on the primary QS server along with PDSS and LOGS.

CDSS keeps a cache of data for every patient in a non-hold bed, plus every patient in a hold bed selected in QPM. It only caches data items that have been specified on the {{DS_PATIENTDATA}} chart. As data is charted, CDSS updates its cache and sends that chalkboard data onto the chalkboards. When the relationship between a patient and a bed changes CDSS receives that information from PDSS and passes it onto the chalkboards. CDSS also has the capability of providing data to the chalkboard when the chalkboard asks for it, and for correcting the CDSS cache and its clients chalkboards during a verify. There is only one CDSS in a given QS system. If the CDSS process isn't functioning, PDATS and PDSS send information directly to the chalkboard. As data is updated it will always be displayed on the chalkboard, but if CDSS is unavailable, any initial data values will be displayed as `???` (three question marks) on the chalkboard until CDSS becomes available and executes its verify pass.

This process (like PDSS) runs a verification process every four hours. The times for this verification vary from site to site because the base-hour varies. You can locate the base-hour and the next scheduled verify by performing a process show.

- **Data files**: The CDSS data files are found in `\qs\data`. These files consist of two “recovery” files (`cdsrcvr.v0` - primary and `cdsrcvr.b0` - backup) used to regenerate the roster when the system or the process is restarted.
- **Log files**: The log files are found in `\qs\logs\cdss`. These files consist of a CDSS - the detail process logs, VERIFY - the CDSS verify detail logs, and ADMIN - the admin thread log for this process.

HIS

Hospital Information System (HIS) controls the interchange of data between the QS and hospital information systems. Acquisition of data from external sources is handled by the HIS Inbound Interface.

Distribution of patient data to external sinks is handled by the HIS Outbound Interface.

The HIS Inbound Interface receives messages from external computer systems which contain ADT information or lab results. The inbound interface will accept messages formatted using the HL7 Standard as well as custom, non-HL7 message protocols. The messages are parsed and stored in the patient data record. The interface to the external system may be RS-232 or TCP/IP.

The HIS Outbound Interface generates messages containing patient data and forwards them to external systems through a network connection using the TCP/IP protocol suite. Message content is configurable using message template charts. Generation of outbound messages can be triggered automatically when a patient is transferred to a 'Hold' bed in a unit that has been specified in a configurable list or manually at the users request. Outbound messages are formatted using either version 2.1 or 2.2 of the HL7 standard.

In general, each type of HIS interface, inbound or outbound, must be run as a separate HIS process on a separate workstation. If no HIS interfaces are established, then HIS is not executed.

- **Data files**: none
- **Log files**: This application's log files can be found in `\qs\logs\his_xxx` (where `xxx` is the extension for the type of system interface, usually HL7). These files consist of the following detail:

  `HIS_xxx log` which details the HIS process

  `<acquire> log` which details specifics about the acquire

  `<acquire> data log` which details data tracing for the specific acquire

  Where `<acquire>` represents the name specified in the Manage Configuration - System - Acquire definition (for example, if the acquire name is ADT, the logs will be called `ADT.00 - ADT.10`).

HL7Out

HL7 Outbound (HL7Out) runs on any workstations in a QS environment and manages the scheduling of sending patient data outbound automatically through HL7 messages. The scheduling is based on a set of trigger events: Time Based, Item Completion, and Patient Discharge.

Lab Access Server

Lab Access Server (LAS) provides lab data to Solar monitors on the Unity network. Only one LAS process is run per Unity LAN.

LAS keeps a list of registered monitors, their associated TCP/IP address and port, along with what patient was associated with the monitor the last time the monitor registered with LAS. LAS receives requests from Solar monitors for registration, ADT Data,

Lab Directory, Lab Data, and Microbiology/Blood Bank data. It also receives notifications from HIS about new lab data for a specified patient.

- **Data files**: none
- **Log files**: The logs for LAS can be found in **\qs\logs\las**. They consist of a LAS log which details process information and a log for the defined acquire. The log file will consist of an acquire name with an extension of **.00 - .10**.

LOGS

The LOGS application runs only once in a QS environment on a primary or load-share server. This application is responsible for logging information from the other active processes. It is usually found on the primary server (QSServer) running with PDSS and CDSS but is not limited to such. If the LOGS process is not alive or reachable, then the message will be written to **qserror.00** on the local hard disk.

CAUTION: Log files should never be opened (with editors such as Notepad, Word, and so forth). If it is necessary to inspect the content of any log file, users should copy the file(s) of interest and rename it (them). The duplicated file(s) may then be opened without risk. Failure to comply with this caution could cause the associated processes (and the QS) to malfunction.

NOTE: All log files in a QS environment follow the same name extension convention. Files with the `.00` extension will always be the most recent and `.10` will always indicate the oldest files. The logs are always in a subdirectory of `\qs\logs` on the primary QS drive on the machine that runs the application.

- **Data files**: none
- **Log files**: This application's log files can be found in the `\qs\logs\logs` subdirectory. There may be up to eleven files named `QSLOG.00 - QSLOG.10`.

Patient Data Server

The Patient Data Server (PDATS) application runs multiple times in a QS environment on workstations or servers. It is usually found on all client machines; mobiles and print servers are avoided if possible. This application is the patient cache server. When a patient file is being accessed, for either reading or writing, the patient data is loaded into a cache (RAM) on a workstation for faster access. Each patient file is handled by a PDATS slot, which is essentially a thread that provides service for that patient.

PDATS is the primary way that most QS programs query and store patient data. When PDATS receives data to be stored, it gives that data to PFILS so that the data will be stored in the file. Likewise, when a PDATS slot is being loaded, it requests patient data from PFILS.

PDATS also handles computed items and is responsible for item classes as they relate to results reporting. There may be many PDATS processes running in a QS system, although only one PDATS process should be on any given workstation. If a PDATS dies or is unavailable, Patient Data Services Server (PDSS) will cause a different PDATS workstation to provide service for the patient(s) to be cached.

- **Data files**: none
- **Log files**: This application's log files can be found in `\qs\logs\pdats`. These files consist of only a PDATS log. This log contains all cache-slot 'load' and 'unload' transactions.

PDSS

The Patient Data Services Server (PDSS) application runs only once in a QS environment on a primary or load-share server. This application is responsible for maintaining information about resource availability on the various workstations and patient data resources. As an example, this application keeps track of the number of PDATS slots available, in use, and who is loaded in these slots, as well as the patient file storage location.

PDSS accepts inputs from HIS and QPM to admit patients to the QS, transfer them to different units and rooms, and other high-level management functions. PDSS provides demographic information to QS processes requesting directory information. PDSS also manages the gate status, which inhibits most QS processes from starting until the essential QS processes are ready to provide service.

This application usually runs on the primary QS server along with CDSS and LOGS. This application runs a verification process every few hours. The times for this verification vary from site to site because the base hour varies. You can locate the base hour and the next scheduled verify by performing a process show.

If PDSS is not active, then system services are degraded. Users cannot log in and new QS processes cannot start up. However, processes that already know which PDATS/PFILS are providing service for their patients can continue to function.

- **Data files**: This application's data files are found in `\qs\data` for versions 4.05 and above. They consist of two recovery files (`pdsrcvr.v4` - primary and `pdsrcvr.b4` - backup), used to regenerate the roster when the system or the process is restarted.
- **Log files**: The log files are found in `\qs\logs\pdss`. These files consist of a PDSS - the detail process logs, `VERIFY` - the pdss verify detail logs and `ADMIN` - the admin thread log for this process.

PFILS

The Patient File Server (PFILS) application can be running multiple times in a QS environment on workstations or servers. This application is responsible for managing the files in which

patient information is stored. PFILS performs all read and write transactions to these files, as well as file manipulation (renaming, purging, and so forth).

Data for each patient is stored in a separate file. There must always be a primary copy of this file, which has the extension of `.v01`. If the system is configured for redundant PFILS, then a secondary copy of the patient file will be maintained with the extension of `.s01`. PFILS has a verify capability which checks the validity of patient files. There must be at least one PFILS in a QS system. There may be more than one PFILS, but if so, a given patient will be served by only one of those servers. If PFILS is unavailable, then patient data cannot be saved.

- **Data files**: This application's data files are found in `\qs\pfils` on the machine running the PFILS process. The drive may vary but is usually `D:\` (`E:\` on NT systems). The data files are the actual patient data files and have the naming convention of `<patient-id>.v01` for primary files and `<patient-id>.s01` for secondary files.
- **Log files**: This application's log files are found in `\qs\logs\pfils`. These files consist of only a PFILS log. This log contains all information about patient file manipulation and verification.

PMS

The Patient Monitoring Subsystem (PMS) application may be run multiple times in a QS environment on workstations or servers. This application is responsible for acquiring monitor data (adult or fetal), and storing it in the patient's file and/or transmitting it for display on the workstations. PMS can auto-detect per-port-fetal-monitors from Corometrics (115, 116, 118, 120 series, 145, 150, 151, 155, 170 series and 556), Hewlett Packard (135x, 8040A and 8041A), Oxford (Sonicaid Team and Team Duo), AMS (FetaScan 1400 and 1500) and Kranzbühler (FetaCare).

NOTE: Hewlett Packard's medical division is now called Agilent Technologies.

NOTE: Support for Oxford Sonicaid, AMS and Kranzbühler monitors from QS version 5.05.

PMS maintains a 30-minute cache of parameter data, a 50-minute cache of fetal data, and broadcasts fetal monitor data to all requesting clients. PMS receives annotations from FMS and provides data for monitor charts to QPM. If notification is enabled, PMS will analyze fetal heart rate (FHR) data, notify QPM/FMS of Hi, Lo, and Penlift states, and receive notification acknowledgment from FMS. PMS also supports Spectra Alerts. PMS may run on more than one server or workstation. The PMS process starts several threads for each configured acquire while the acquire monitors data that is to be supported by PMS on assigned workstation. If no acquires have been configured for a given PMS on a given workstation, PMS will terminate execution.

- **Data files**: The NOTIFICATION_SETTINGS.DAT file is found in `\qs\data` on the workstation running this process. This file contains the Fetal Notification settings for each bed in a QS environment. It does not apply in an ICU environment.
- **Log files**: PMS log files can be found in `\qs\logs\pms`. These files consist of the following:

  `PMS log` which details the PMS process

  `<acquire> log` which details specifics about the acquire task

  `<acquire>-data log` which details data tracing for this specific acquire task

  `<acquire>-trace log` which contains the tracing files for the acquire task.

  The `<acquire>` represents the name specifies in the Manage Configuration - System - Acquire definition (e.g. if the acquire name is SERIALFM, the logs will be called `SERIALFM.00 - SERIALFM.10`).

PtD

The Patient Daemon (PtD) process is responsible for on demand or scheduled requests to automatically record data, transfer patients, export patient data, backup patient files and purge patients from a QS system. This process can be found running multiple times in a QS environment.

- **Data files**: The data files for PtD can be found in `\qs\logs\pdss`. They consist of several `.dat` files that keep track of which patients, charts and jobs have completed.
- **Log files**: The log files for PtD are found in `\qs\logs\ptd`. These files consist of a PtD log which details the PtD process and a detail log for each PtD job defined on the system. These log files have the same name as the job definition—up to 32 characters and with `.00 - .10` extensions. They detail specifics about the activity of each configured, enabled PtD job.

QPM

QS Program Manager (QPM) is the user interface application and is used to interact with the system. This application runs on all interactive workstations being used for patient data retrieval or review.

- **Data files**: none
- **Log files**: none

SPP

Scheduled Print Process (SPP) runs on any workstation in a QS environment that manages a printer that a site wants to run scheduled print jobs automatically from the QS. From QS version

5.05.0, SPP supports scheduled batch printing (printing a collection of documents at a specified time or interval).

- **Data files**: The data files consist of three `.dat` files found in `\qs\spp` on the workstation running the SPP process. These files keep track of which patients, charts and jobs have completed and aid in the recovery process should SPP fail.
- **Log files**: The log files for SPP are found in `\qs\logs\spp`. These files consist of the SPP log, which contains information about the SPP schedule.

System Functions

This section of the manual consists of additional information about several parts/functions of the QS system. This information is intended to provide a better understanding of the QS. Information is grouped by function, rather than by QS process.

Log files

All processes in the QS system maintain their own log on the local harddrive. The log messages are written to a log file in `\qs\logs\<process name>`. A set of up to 11 log files are maintained, with extensions `00 - 10`. The file with extension .00 is the newest.

When the line count of the current log file exceeds it's maximum (2000 lines by default), the log file with extension `.10` is deleted, the existing logs renumbered with the next higher number, and a new log file with the extension `.00` is started. This so called *cycling* of the log file can also be requested with an admin command.

Messages have the following format:

```
10/11 10:08:08   QSClient1:QPM > My log message
date time     workstation:process>log message
```

If the LOGS process is not available, a process will attempt to write locally to `\qs\logs\qserror.00`.

When a new process is started, it will cause the contents of `qserror.00` to be added into `qslog.00` if LOGS is running and `qserror.00` is not too big.

If a process cannot log to its current log file (`.00`), a log file with the extension `.99` will be created. The existence of this log file will block further logging by the process. Therefore, log files with the extension `.99` should be deleted. While the `.99` file exists, the process will log to `QSError.00`.

The LOGS process additionally maintains the central log file (`qslog.xx`) and the user action log (`ua.xx`).

The central log file contains important messages from various QS processes.

The user action log logs user activity on the system like selecting a patient, displaying a form, and so forth

Abnormal log messages can often be recognized by:

- exclamation points in the message
- the words: unexpected, error, time-out
- the same message repeated over and over in the logs

When a process is terminated abnormally, it writes error information to **errorinf.$$$**. Errorinf files with less than 1024 characters will be written to the central log file, otherwise a message is logged that the error information was too large to log.

Storage Configuration

In every QS system, patient data is stored in duplicate on the server's hard-drives. Optionally, one copy of the data may be written to a second server (backup server) instead of the primary server's second disk.

Single Server Systems - Microsoft Windows NT

A common disk configuration for the primary QS server in a Microsoft Windows NT configuration is shown in Figure 1-4.

The first partition set consists of three partitions implemented on a RAID-5 array of three identical physical disks.

With the RAID-5 array, three disks with *n* GB storage capacity yield a total usable disk space of 2n GB. This RAID array is implemented at the hardware level, not the Microsoft Windows NT level, by using an array controller.

Table 1: What the server partitions include

Disk	Partition	Includes
Disk 1	C:	System Files
Disk 1	D:	QS software
Disk 1	E:	PFILS (QS patient files and Microsoft Access database files
Disk 2	F:	copy of QS software
Disk 2	G:	copy of PFILS

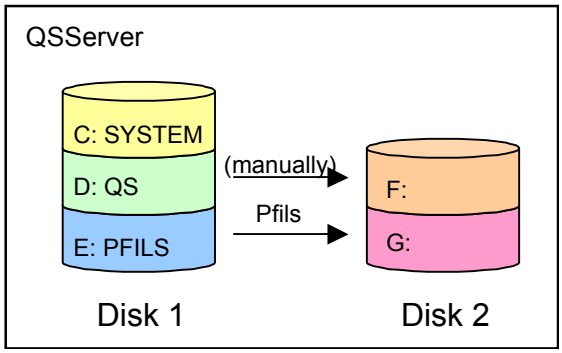


Figure 1-4: Single Server Disk Configuration - Microsoft Windows NT

Maintaining the copy of the patient files is the responsibility of the PFILS process. As soon as an item of data is entered and the user moves to the next input field on a form or chart, PFILS writes the data to both copies of the patient file.

The Microsoft Windows NT drive letter assignments are summarized in Table D-2.:

Table 2: Drive Letter Assignments - Microsoft Windows NT

Drive Letter	Purpose	File System
A	Floppy disk	FAT
C	Boot and System partition	NTFS
D	QS partition	NTFS
E	Patient files (PFILS) partition	NTFS
F	QS Backup partition	NTFS
G	Patient files backup partition (PFIL-BACK)	NTFS
H	CD-drive	CDFS

Single Server Systems - Microsoft Windows 2000 and 2003

A common disk configuration for the primary QS server in a Microsoft Windows 2000 and 2003 configuration is shown in Figure 1-5.

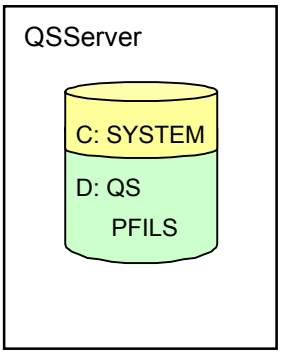


Figure 1-5: Single Server Disk Configuration - Microsoft Windows 2000 and 2003

The first partition set consists of 2 partitions implemented on a RAID 5 array of 2 identical physical disks.

With the RAID 5 array, 2 disks with *n* GB storage capacity yield a total usable disk space of 2n GB. This RAID array is implemented at the hardware level, not the Microsoft Windows level, by using an array controller.

The single disk 1 holds the system partition **C:** with the Microsoft Windows 2000 and 2003 system files. The QS partition **D:** holds the QS software and PFILS (that holds the QS patient files and the Microsoft Access database files).

The Microsoft Windows NT drive letter assignments are summarized in Table 3, “Drive Letter Assignments - Microsoft Windows 2000 and 2003,” on page 22.:

Table 3: Drive Letter Assignments - Microsoft Windows 2000 and 2003

Drive Letter	Purpose	File System
A	Floppy disk	FAT
C	Boot and System partition	NTFS
D	QS partition Patient files (PFILS) partition	NTFS
E	CD-drive	NTFS

Dual Server Systems (Microsoft Windows NT Only)

In systems with a backup server, Disk 1 of the backup server acts as the receiver for the data from the primary server's **D:** and **E:** partitions. The configuration for this type of system is depicted in Figure 1-6. For both servers, the two **C:** partitions are identical.

The data on the QS partition (**D:**) is periodically copied by the QSCopy application. The frequency of the copy is configurable and is by default once every 60 minutes.

As in the single-server system, maintaining the copy of the patient files is the responsibility of the PFILS process. As soon as an item of data is entered and the user moves to the next input field on a form or chart, PFILS writes the data to both copies of the patient file.

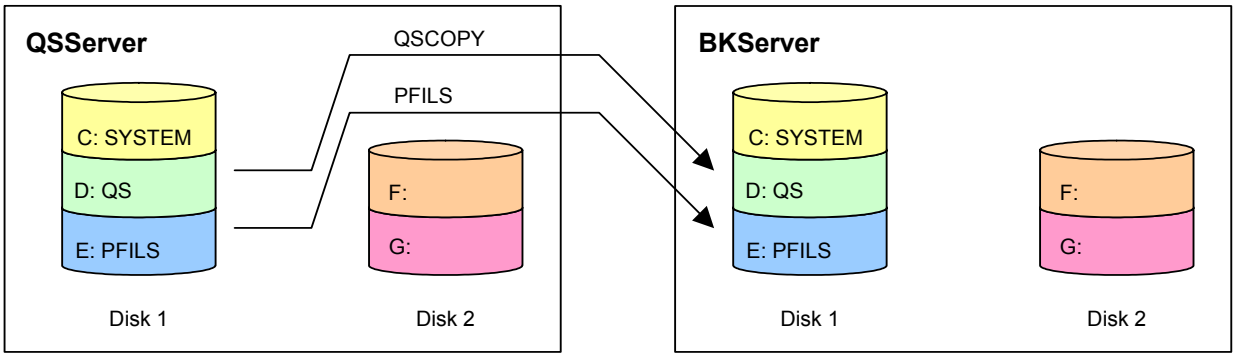


Figure 1-6: Dual Server - Disk Configuration

QS Directory Structure

The QS directory is the place where most of the QS-relevant files are stored. Every server and workstation in a QS system has a QS directory. Workstations have a subset of the QS directories shown here.

NOTE: This directory structure is a typical example. The structure for the site may vary from this example.

Table 4: Example of a Directory Structure

Directory	Description
D:\QS\Archive	Holds the patient files that are waiting to be archived. They are copied here by the PtD process.
D:\QS\Archive\Image	The working directory when archive CDs are being created.
D:\QS\Data	This directory holds the strings files. Together with the site tables, these determine the language in which the QS is presented to the user.
D:\QS\Exe	Here you will find all the QS executables, DLLs and utilities, such as Cdatdisp. For a primary QS server, the contents of this directory is copied from the Update directory, every time the server starts.
D:\QS\HL7Out	This directory contains the recovery files and end of job reports related to HL7 Outbound processing.
D:\QS\Logs	Logs holds all the log files for the processes running on the local machine. On the QSServer, logs also keeps the main QS log file (QSLog) and the user activity log file (UALog).
D:\QS\MSAccess	The directory where the Microsoft Access database files are stored.
D:\QS\Pfils	The directory where the patient files are stored.
D:\QS\Release\NT	This directory contains the application and configuration files for the servers (QSServer.bat) and the clients (QSClient.bat). The clients copy strings, help, release and patch files from here at startup.
D:\QS\Site	The site tables are stored in this directory. Together, the site tables form the configuration database. Although the database consists of a number of separate files, it is not possible to replace files one-by-one. The files form a relational database and if single database files are replaced, references in the database may be lost and the database will become unusable.
D:\QS\SPP	This directory contains the recovery files and end of job reports related to SPP.
D:\QS\Tools	In the tools directory, all the startup batch files and utilities are found that have no place in the EXE directory or in one of the subdirectories of Release. It also holds templates for QSServer.BAT, QSClient.BAT and QSClient.CMD.
D:\QS\Web	This directory contains the executables, Active Server Pages and help files for the OB Link Web site. This directory is only present on QS servers in a surveillance system with the OB Link option.

Archive and Restore

Long-term storage of patient data in the QS is achieved by writing patient files to CD-ROM or a hard drive. The patient data can later be restored using a user menu selection within the QPM application.

The archiving process

Figure 1-7 provides an overview of the archiving process:

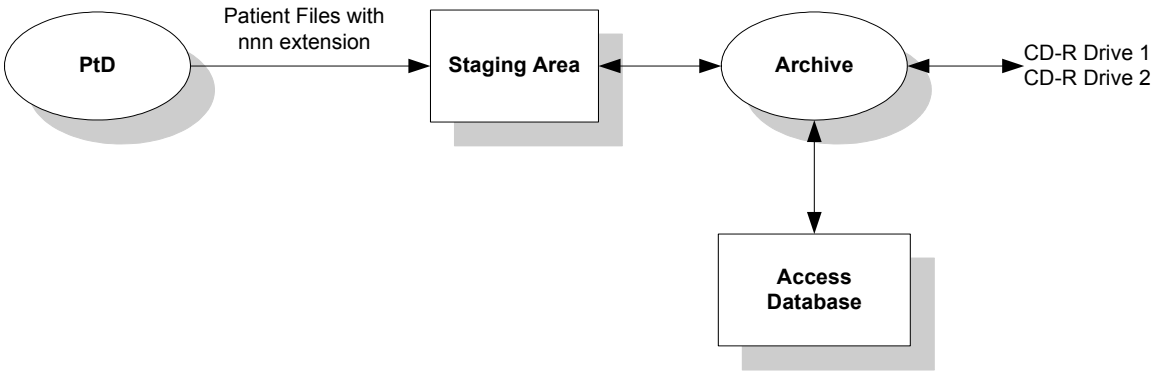


Figure 1-7: Archive Data Flow

PtD will periodically copy patient data that is ready for archival into an area on a hard drive known as the staging area. The Archive server checks once per interval (default interval is 60 minutes) for data that is ready for processing. If files are found with extensions between 000-999, they are assumed to be patient data files. These files are verified and compressed. If sufficient data has accumulated in the staging area (default 600 MB compressed data) or sufficient time has elapsed since the previous archival (default 90 days), the data will be copied to a pair of CD-R discs or to a hard drive, or both.

There will be only one Archive server running at a given QS site. Archive is run on the main server so that it can take advantage of the file protection available on the server's disk.

Since the Archive process often executes on a server far from any consistent user observation, Archive will send messages to logged-on QS users for important events. Important errors are sent to all QS users while success or maintenance messages are sent only to system staff. The following messages may be generated:

All users:

- Insufficient disk space to perform archive
- Error writing to CD-R Device *x*
- CD Volume *x*, written to CD-R Device *y* failed verification!
- No blank disks found while attempting to write CD.

System staff only:

CD-R Device *x*: No disk. Please insert new, blank disk.

Used data disk. Please insert new, blank disk.

Damaged disk. Please insert new, blank disk

CD-R Device *x*: Unknown disk. Please insert new, blank disk.

CD successfully written and validated to CD-R Device *x*, Volume name: *y*

The archive database

Archive and restore use an Access database to store information about patients that have been archived. This database is located in `\qs\archive\NTArchive.mdb`. The database will grow larger as data is archived.

Never delete, overwrite, rename, or open the database (unless directed by QS Technical Support) or you could corrupt the data that has been archived to disc.

The Access Database is used to maintain a directory of all archived patients, and information about each patient file that would aid in efficiently restoring a patient file regardless of how long ago that patient was archived. This information includes but is not limited to the volume (disc) they were archived to, patient name, patient ID, the date the file was archived, the media to which the patient file was copied and the status of the patient file.

The database file will grow as data is added into it. According to Microsoft, the maximum size of an Access database using the Microsoft Jet engine is 2 gigabytes (GB). If the average patient record in this database is 1KB (it's probably less), you would be able to fit approximately 2,000,000 of these records in the database.

Archive and Restore use a Data Source Name (DSN)-less connection to connect to the database. This means that you do not have to go into the control panel and set up a DSN for the connection to work. The QS will take care of the connection for you. However, a copy of the appropriate ODBC driver (MDAC) must be installed on each computer for the queries to function.

Patient file size considerations

If a patient file is too large to archive because of available memory constraints or the CD-R storage media limitation of 600MB, the `.000` file will remain in the staging area indefinitely and be renamed with a `BIG-nnn` extension. Thus, the file will never be able to be archived or restored. If a site wants to restore the file, they will need to manually copy the file from the staging area to the PFILPATH and rename the file to a `.V01` extension. They then need to issue the command, `QSMAN QSSERVER PDSS SET RESTORE=<PatientID>@QSSERVER` in order to restore the file (`<PatientID>` is the ID number of the patient).

How Archive initializes compact discs

When Archive encounters a blank disc, it initializes the CD-R before writing to it. Disc initialization occurs automatically, requiring no action by the user.

Each pair of CDs will be assigned the following volume name:
PPDDDYYYYNN

PP is the configurable prefix that can be set in the Designer. QS is the default

DDD is day of the year (January 1st is 001 and December 31st is 365 in most years)

YYYY is the year (2002)

NN is a count that goes up if more than one batch of CDs is created in a day. This starts at 01.

What happens when one of the CD-R drives is not operational

Archive is able to work with just one CD-RW drive. Archive always makes two CDs for a given batch of data. Should one drive fail, the first data copy (image) will be written to the first available functioning drive. Once the CD-R disc is replaced, Archive will write the second copy of data to the same drive.

CD-R life expectancy

CD-R life varies according to type and manufacturing method. Manufacturers claim 75 years (cyanine dye, used in *green* discs), 100 years (phthalocyanine dye, used in *gold* discs), or even 200 years (*advanced* phthalocyanine dye, used in *platinum* discs) once the disc has been written. The shelf life of an unrecorded disc has been estimated at between five and ten years.

Exposing the disc to excessive heat, humidity, or to direct sunlight will greatly reduce the lifetime. In general, CD-R media is far less tolerant of environmental conditions than pressed CDs, and should be treated with greater care. A scratch in the top surface (label side) will render a CD-R unusable. CDs should be stored in a cool, dark, dry place.

CD Re-Writable (CD-RW) discs are an entirely different media and are not compatible with CD-R media or devices. CD-RW discs have an entirely different composition.

Other important things to know about Archive

- Each compressed patient file must be smaller than 600 MB as the available space on a
  CD-R is limited to 600 MB and the Archive feature does not have the ability to straddle one patient file across multiple discs. If files are encountered that are too big, the file will be renamed with a `BIG-nnn` extension.
- The time and days that PtD backup jobs occur should be carefully considered. It would be best to have the patient files *ready to be compressed* when other processes are NOT running verifies and when very few users are on the system. Then, theoretically, when Archive initializes (every hour), it will go through its compression process and have less impact on the system performance.

- A CD-R can not be burned if less than 1.5 MB of compressed patient data exists.
- Archive will always attempt to write as much data as is in the staging area to CD-R regardless of the current MB_DATA setting, up to 600MB. For instance, if the MB_DATA setting is 200, when 200MB of compressed data has accumulated in the staging area, archive will attempt to copy this data to CD-R. However, if there are no blanks in the drives, archive will not be able to write, but will continue to accumulate and compress data. If, when there are finally blanks available, 500MB of data has accumulated in the staging area, archive will write all that data to a pair of duplicate CD-R's, not just 200MB. If 700MB of data has accumulated, the oldest 600 MB will be archived and the remaining (most recent 100MB) will be left in the staging area until archive is triggered again, either manually by **SET ARCHIVE**, by **TIME_SPAN** or **MB_DATA**.
- On termination, Archive closes all files and de-allocates memory. Archive can not be terminated while it is in the middle of writing to CD-R, because the Nero interface software will hang. Therefore, if a termination admin command (stop, cycle, cycle with reboot) is received, Archive will delay termination until the current archival process is complete. When an Archive **STOP**/**CYCLE** is issued and Archival has already begun, it can take up to 4 hours to stop Archive.

Files used by Archive

In the staging area:

ptid.nnn - the patient file copied in by PtD

ptidmmddyyyysssssssss.tmp - the working file during preprocessing

ptidmmddyyyysssssssss.gz - the compressed file ready to be written to CD

ptid.BAD-nnn - patient files that failed verification

ptid.BIG-nnn - patient files that are greater than 600 MB when compressed, and thus too big to fit on the media

NTArchive.mdb - the Access database file

error.out - a temporary file that only exists during interval processing. Contains any redirected errors from the Stingray compression software

In the image directory:

Used by Microsoft Windows 2000 and 2003 Configurations Only (Nero)

QSDDDYYYYNN.REC - lists all patients that will be stored in the archive

QSDDDYYYYNN.NRG - the image file as the archive is being created

QSDDDYYYYNN.1 - the image file as it is being copied to the 1st CD

QSDDDYYYYNN.2 - the image file as it is being copied to the 2nd CD

QSDDDYYYYNN.DONE - the recovery file after both discs have been created

NOTE: Microsoft Windows 2000 and 2003 versions of Archive will also archive any existing **CDATS.zip** (backup) files to the CDS.

Used by Both Configurations

VOLPARAM.INI - parameters used by CD writing software

QSDDDYYYYNN.TXT - comma-delimited ASCII DB entries for the patients in a given volume

Used by Microsoft Windows NT Configurations Only (SmartStorage)

QSDDDYYYYNN.CDI - the image that will be written to CD for the volume name to the left of the dot

QSDDDYYYYNN.LAY - specification for files to be included in the image and their ultimate destination on the CD

PRETXT, PRECDI, PRELAY - initial versions of the files listed above

QSDDDYYYYNN.LVT - transient file created and destroyed by Smart Storage in the creation on the **.PRECDI/.CDI** image file

QSDDDYYYYNN.DAT - transient file created and destroyed by Smart Storage in the creation on the **.PRECDI/.CDI** image file

Archive Admin Commands

For a list of administrative commands that can be issued to control Archive, see “Archive Arguments” on page 53

Example output from `qsman qsserver archive show`:

```
Sending SHOW to ARCHIVE on QSSERVER

Archive GA R5042L16 1999 running at QSSERVER      Terse

Up since: 10/11/1999 18:01:13      Current time: 10/11/1999
21:09:52

Staging Area \\QSSERVER\Archive\: Data ready for archival:
256 MB/42 files MB free: 701

Target Drive 1: Data or other used disk. Please replace with
blank disk. Drive Status Date: 10/11/99 21:04:05

Target Drive 2: Data or other used disk. Please replace with
blank disk. Drive Status Date: 10/11/99 21:04:05

Current Settings: 60 Minute Interval; 1X Write Speed
                  90 Day Time Span;   600 MB Data Threshold

Next archival to disk starts in 75 days or 344 MB

Archive status: Last Archive: An unspecified error was
returned by the last attempted archive.

Last archive error: Could not inventory CD-R Device 2: Drive
may be empty.

Last completed volume: BZ270199902 126 MB/100 files on 09/
27/1999

Admin: 2 @ 10/11/1999 21:09:52; Processing SHOW
```

```
Archive: 4 @ 10/11/1999 21:03:33; Waiting for next interval
in 60 minutes
```

QPM Restore

The Restore Patient QS Action will launch an appropriate dialog box if the corresponding license has been purchased. This dialog box will not be displayed unless you have the Archive license and the currently logged on user has the Restore user privilege.

The search criteria in the upper left-hand corner of the dialog box are used to search for patients that match all of the specified criteria. Patient Id, Patient Name, CD-ROM and Date Archived are always displayed. There are 3 user configurable items (in this case Delivery Date, PT-AGE, and Gravida) that are only displayed if they are configured.

After the user has specified all of the search criteria that they are interested in, they click Search. This will populate the bottom half of the screen with the patients that meet the selection criteria. Following the list of patients, one can see the number of patients that matched the search criteria. The columns can be sorted by clicking on the title name for the column. The columns contain:

- **Patient Id—**the Patient ID of the file that was archived
- **Patient Name**—the latest charted value for patient name. If no patient name was charted, this will say `No Name`
- **User Configurable Items**—The values that were charted for user configurable items 1, 2, and 3. The title shown is the name of the item that is currently configured for that user configurable item.
- **CD-ROM**—The volume name of the CD where the data has been written. If blank, the data is in the staging area.
- **Date Archived**—when the data was written to CD
- **File name**—the filename of the patient file on the disc. This is the compressed file name.
- **File Size**—the size of the patient file

To restore a patient, either double-click the entry or highlight and click Restore. The following things may happen once you initiate a restore:

- If it cannot communicate with the Archive server and the data is in the staging directory but not yet on CD-R, Archive will give you an error message that it can't find the staging area.
- If the data is on a CD-R and Archive cannot find that CD-R in the drive of the machine running Restore, it will prompt you to put that CD-R into the drive.

The patient data file will be copied to the `\qs\restore` directory on the client workstation where the file will be uncompressed and verified. The patient file will then be copied to PFILS and a restore command will be issued to PDSS.

If the patient ID is already active in the QS system, you will be prompted to specify a different patient ID. This has the same effect of doing a change ID on the file that you are restoring into the QS system. The patient already in the QS system is unaffected by this.

The patient file will go into the unit specified in the upper right-hand corner of the Restore dialog box.

The restored patient will become the selected patient in the QPM that is running the Restore dialog box.

Problems restoring due to dirty CD drive or CD-R media problems

Scratches on the CD-R media or dirt on either the CD-R media or the lens in the CD drive can cause problems when trying to restore files. Several steps can be taken to remedy this situation.

First, make sure the CD-R media is clean. Any foreign matter large enough to see on the bottom side of the CD-R must be removed. CD-R manufacturers recommend cleaning the CD-R with a soft, dry cloth. Do not use any solvents.

If the CD-R has light surface scratches on the bottom side, in some cases they may be polished out. There are commercially available polishes designed for use on CDs. Follow the instructions included with the product. These will only repair the lightest scratches.

If the CD-R itself is not the problem, it is possible that the laser lens in the CD drive has accumulated dust or dirt.

Printing

Batch printing

As indicated by Figure 1-8, the QS supports batch printing, which allows printing of multiple objects (such as charts and forms) with one request. This capability is useful for daily shift prints, discharge prints, transfer prints, and physician rounds prints. Under the Clinical Print tab of the Designer there is a choice called **Batch Print**. These are defined by the System Manager and added to the appropriate user views. Each element in the batch has a range of time of data to be printed (i.e. 8 hrs, 12 hrs, 24 hrs, all data, and so forth). The user invokes the batch through one of the navigators. A batch print dialog box will appear and the user must provide an **Anchor Date** and **Time** (end of the range of time), select a print queue and click **OK**. The batch will send all print jobs to the printer associated with the selected queue.

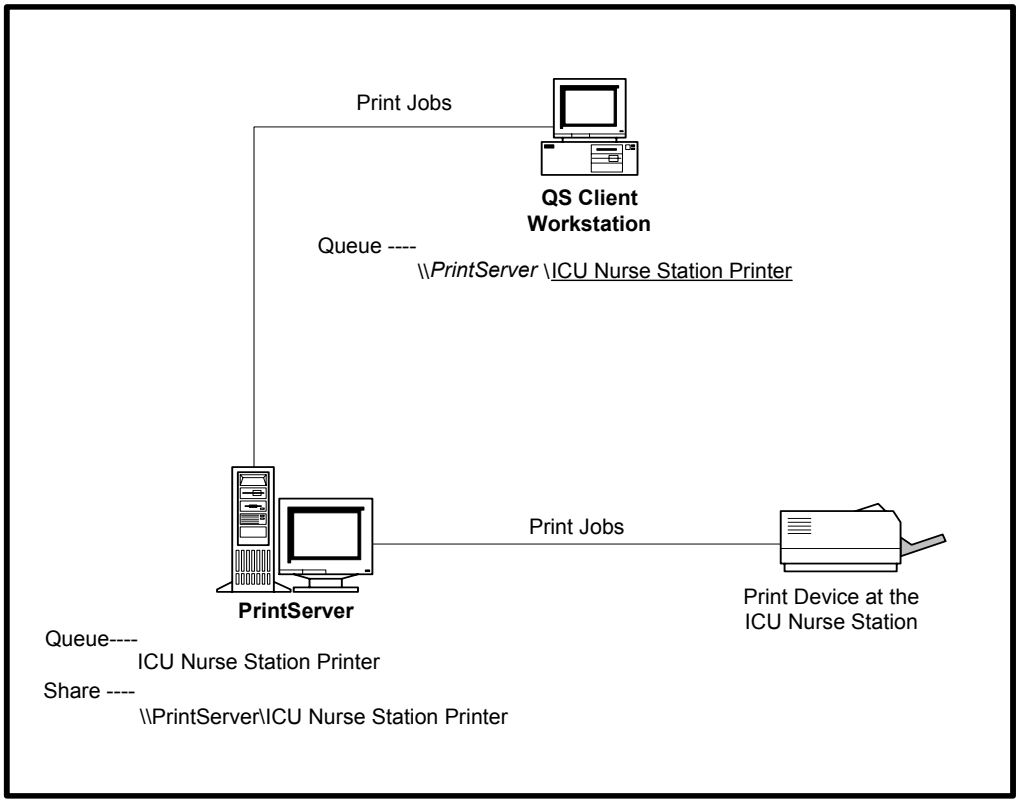


Figure 1-8: Printer Configuration for Batch and Scheduled Printing

Scheduled printing

As illustrated by Figure 1-8, printing may be scheduled to automatically print at a predefined day and time. Under the Clinical-Print tab in Designer you will find a Scheduled Print selection. The System Manager can create scheduled print jobs to run on specified workstations and print to specified printers. This functionality is useful for physician rounds print jobs, shift print jobs, and daily medical records print jobs.

Scheduled Print Program (SPP) replaces the user for the purposes of a batch print. Therefore, as part of the scheduled print job definition the System Manager must minimally specify the following:

- Scheduled Run Time.
- Data Range End Time (Anchor Time).
- Whether the data Range End Time is before, the same as, or after the Scheduled Run Time.
- Which Batch jobs to Print.
- The Patient Selection Criteria (i.e. which patient population to print).
- The workstation on which it will be run.
- The printer where the output shall print.

- The print-template used for the end of job report. If this template has a region, it will be filled in with the report from the report-file created by SPP.

The printer selection field on the dialog box uses a list to display all the printers in the QS Printer Configuration. It also supports free text entry. The System Manager must select the printer name from the drop down list.

The text files (other than logs) created by the SPP process(es) are located in the **\QS\SPP** directory. The files are:

- JobRecovery.dat - This is the job and patient recovery file. It lists the SPP job being run and the list of patients selected.
- PtRecovery.dat - This shows the status recovery file. It lists the current patient, the last run batch ID and the last run element.
- RetryCount.dat - This is the retry count file. It contains the current retry count.
- SPPReport.txt - This is the end of job report that is written while SPP is running a job.

QS Office Client

The QS Office Client product provides remote and local users with full Quantitative Sentinel Program Manager (QPM) application functionality via Microsoft Windows 2000 or 2003 Terminal Server.

Users must be provided the following for use of QS Office Client:

- TCP/IP connectivity to the QS network (VPN recommended, 28k dialup is sufficient)
- Logon access to the Terminal Server
- Microsoft Windows Terminal Server Client software on their Microsoft Windows 98, NT4, 2000, or 2003 workstation
- Logon Access to QPM

The following limitations apply to Office Client:

- 34 concurrent users per Terminal Server
- All Terminal Clients must use the same view and settings

Patient Restore functionality is not available.

OB Link

QS Web server interface (OB Link) is a Web-based solution to deliver and display fetal trace data, fetal alerts and other charted patient data to remote client Web browsers through the Internet Information Server. For a sample OB Link screen, see Figure 1-9.

The OB Link Web application uses Active Server Page (ASP) technology to embed the patient data in Web pages using HTML format. An Uniform Resource Locator (URL) will initiate the

transmission of fetal heart rate data from the QS Web server (ISAPI DLL) to the Java applet running in the client browser.

From 6.70 onwards OB Link on SSO is supported.

The QS must be at version 5.05 or higher to run OB Link.

Figure 1-9: OB Link Fetal Strip Display

QSWeb

The `QSWeb.DLL` component is loaded by the Internet Information Server (IIS) application (`InetInfo.exe`) that resides on the `C:` drive. `QSWeb.DLL` is configured as an ISAPI filter to the IIS application and is loaded during startup of IIS. QSWeb interfaces with the other QS processes to generate the Web pages for the OB Link Web site.

This feature has been developed to run on the main QS server but can optionally be run on a QS Load Share server–however, QSServer must be running on the workstation functioning as the QS server.

Internet Information Server (IIS from Microsoft)

This is also known as the Microsoft IIS application. It is a Microsoft Windows service that can be controlled via **Settings -> Control Panel -> Services** icon.

IIS 6.0 works on the Microsoft 2003 server. IIS 6.0 by default disables access to the Active Server Pages and the ISAPI Extension. For OBLink to work these extensions must be enabled. This is done automatically by the install process for 6.70.0 or higher.

NOTE: It is important to note that the QS processes (specifically CDATS) need to be started first.

The IIS process need to be set up for manual start from the **Settings -> Control Panel -> Services** icon. Additional information about IIS may be obtained at the following URL:

http://www.microsoft.com/windows2000/server/evaluation/features/web.asp

Log files

The new `QSWeb.DLL` component is loaded by the IIS application (Internet Information Server/InetInfo.exe) that resides on the `C:` drive. When `QSWeb.DLL` attempts to log messages it looks for the proper subdirectories on `C:\QS\LOGS` but the logs subdirectories really reside in `D:\QS\LOGS` in a production environment.

A new optional parameter called `LOGSPATH` will be supported. During the QS initialization process, it will look for the `LOGSPATH` environment variable and use its value as the log file subdirectory. Setting the `LOGSPATH` variable to `LOGSPATH=D:\QS\LOGS` will allow `QSWeb.DLL` to locate the logs subdirectories.

The log files for OB Link can be found in the `\QS\LOGS\QSWeb` subdirectory. The `QSWeb.DLL` loaded by Internet Information Server (IIS) will write to this file.

IIS, which loads the QSWeb DLL, logs to `C:\WinNT\System32\Logfiles\W3SVC1\inYYMMDD.log` where `YYMMDD` is the current date.

Strings Files

The new `QSWeb.DLL` component is loaded by the IIS application (InetInfo.exe) that resides on the same drive as the QS (normally `D:`). When `QSWeb.DLL` is initialized, it attempts to load the string files from `C:\QS\DATA` but the string files really reside in `D:\QS\DATA` in a production environment.

Use the `DATAPATH=` environment variable so that the `QSWeb.DLL` can find the strings files It needs to be set to `DATAPATH=D:\QS\DATA`.

OB Link Web files

A self-extracting archive file `EG6600L14.exe` contains the OB Link Web files.

A new subdirectory `\QS\Web` will contain all the Web-related files for the OB Link Web application.

The `WXxXxLxx.exe` file is a self-extracting zip file containing files for the `\QS\Web\Data`, `\QS\Web\Class` and `\QS\Web\Images` subdirectories and must therefore be executed from the `\QS\Web` directory.

The site Help files are contained in the zip file `UXxXxLxx.zip` and is to be extracted to the `\QS\Web\HELP` subdirectory.

The subdirectory content is as follows:

- Data - Active Server Pages (ASP) files
- Class - Java class directory
- Help - Web-based help files
- Images - Images (and JavaScript) directory

Strip chart applet and screen size applet

In Netscape, resizing the browser window does not resize the applet until you refresh. This is a property of the Netscape browser, and not related to our applet.

When used across international boundaries, the date/time on the strip will be the date/time at the server, but the months will use the client's translations.

When **Daylight Saving Time** (**DST**) switches (April and October in the USA), the times on the strip chart will not switch. If you start the applet in Daylight Saving Time, all times will appear as DST, whether the actual switch occurs before or after.

Although the strip chart looks **real**, it is not. It does not contain the event marks or annotations from the original.

Rips in the strip chart indicate periods when the data was not available. One possible reason could be the fetal monitor is/was off.

On some older browsers, the VCR controls may be replaced by a scroll bar.

The applets log diagnostic information to the Java console. In Netscape Communicator, the console under **Communicator -> Tools -> Java Console**. In IE, it is under **View -> Java Console**.

After a patient ID change, the applet will stop collecting data. Return to the patient select screen and grab the correct patient.

Browser setup

To use OB Link, both Cookies and JavaScript must be enabled. JavaScript may need to be downloaded/installed from the Microsoft Web site.

Under Internet Explorer (4.01 SP2 and subsequent), HTTP 1.1 protocol must NOT be enabled. To disable, do the following:

1. From the menu, under **View**, select **Internet Options**.
2. Select the **Advanced** tab.
3. Scroll down to **HTTP 1.1 Settings** and uncheck **Use HTTP 1.1**.

   If this option is enabled, the Java applet may lock up and binary data may appear in the browser window. If this happens, disable the setting and restart the browser.

Certificate installation

To avoid the dialog boxes informing the user that the site is not trusted, the Certificate Authority must be installed at the client as a Trusted Root Authority. Follow the link from the first OB Link page, then use the following instructions, depending on the client browser.

NOTE: Certificate installation must be performed by a user logged on as an Administrator.

Internet Explorer 4.01

1. When the **File Download** dialog box is displayed, select **Open this file from its current location**, then click **OK**.
2. On the **New Site Certificate** dialog box, ensure **Enable Certificate** is checked. You may leave all of the others checked, but at the very least, **Network server authentication** must be checked.
3. Click **Yes** on the following dialog box to add the authority to your browser.

Internet Explorer 5.0 and higher

1. When the **File Download** dialog box is displayed, select **Open this file from its current location**, then click **OK**.
2. On the **Certificate** dialog box, click **Install Certificate** to invoke the **Certificate Manager Import Wizard** dialog box.
3. Click **Next>** then select **Place all certificates into the following store**.
4. Click **Browse** next to **Certificate store** and select **Trusted Root Certification Authorities**.
5. Click **OK**, click **Next**, and then **Finish**.
6. On the **Root Certificate Store** dialog box, click **Yes** to add the authority to your browser.

7. Click **OK**.

Netscape 4.5 and higher

1. Walk through the **New Certificate Authority** dialog boxes. When prompted to select the certificate's purpose, check **Accept this Certificate Authority for Certifying network sites**.
2. When prompted to enter a **Nickname**, enter **GE** (this is really up to you, but should be something meaningful in case the certificate needs to be retrieved).

Server Startup Process

Figure 1-10 illustrates the server startup process. In short, the QSServer service calls a number of batch files, resulting in the consecutive startup of all configured QS processes.

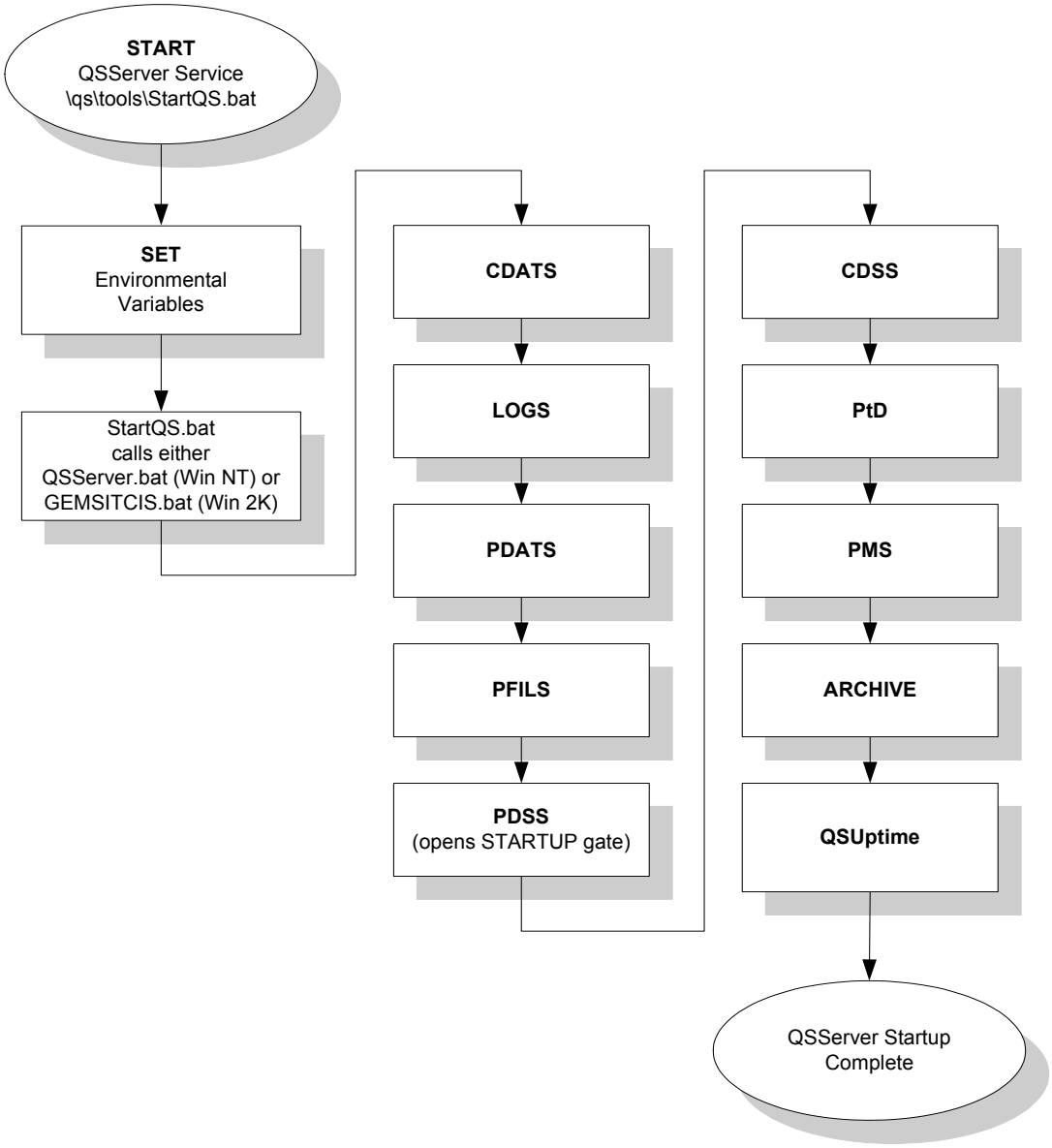


Figure 1-10: QS Server Startup Process

Client Startup Process

Figure 1-11 illustrates the client workstation startup process. In short, the QSServer service calls a number of batch files, resulting in the consecutive startup of all configured QS processes.

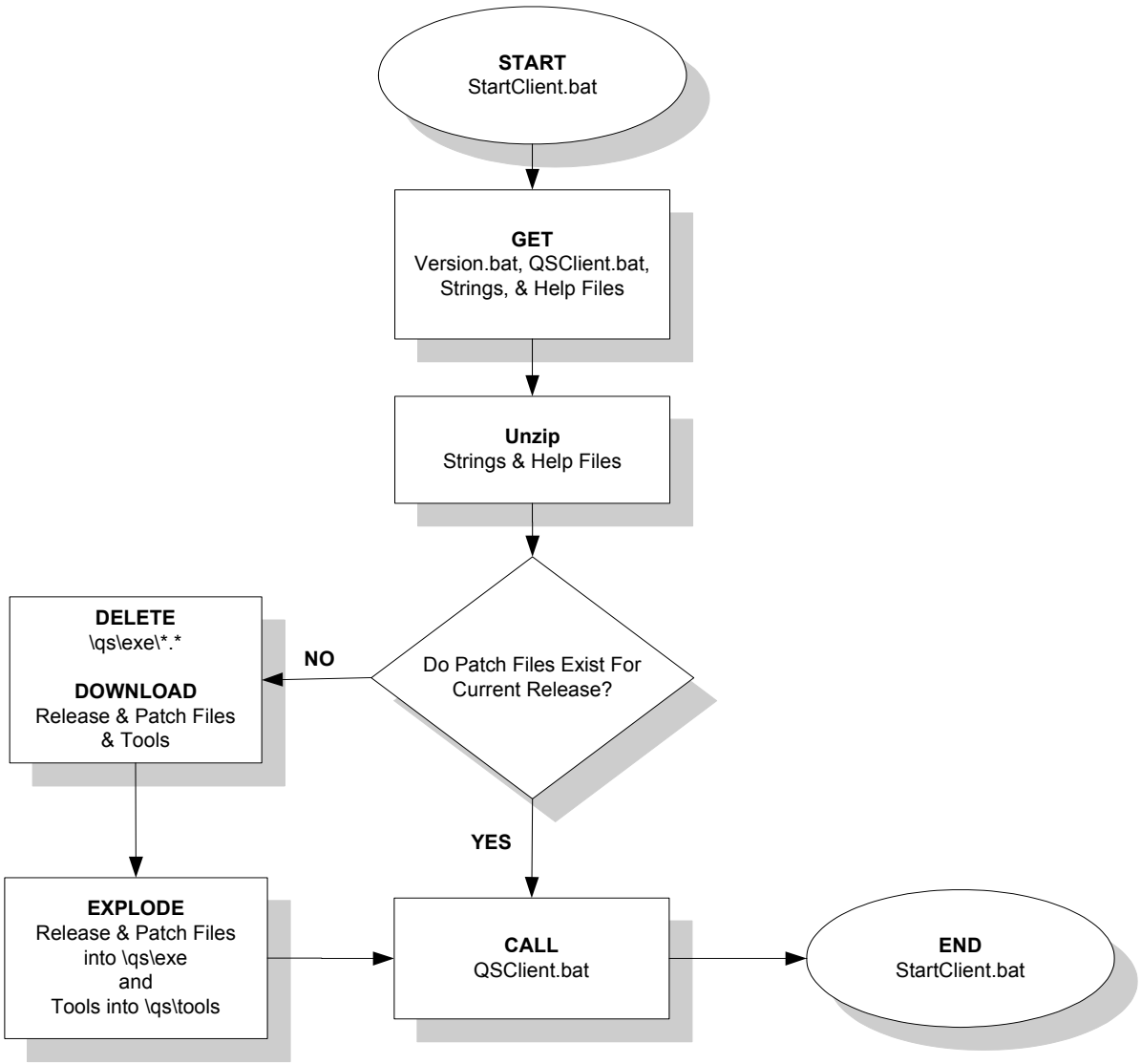


Figure 1-11: QS Client Startup Process

Utility Programs

QS utility programs are essentially software tools that allow System Managers to quickly and efficiently perform support tasks that maintain an optimal QS operational state. These utility programs are identified below and described in the subsequent paragraphs.

What would you like to learn about?

CDATDisp (page 41)

CDUpdate (page 41)

Designer (page 41)

QSCopy (page 42)

QSTest (page 42)

CDATDisp

This utility is designed to export the formatted values of selected CDAT tables to a file. This utility may differ with each version of the QS system. The utility requires input of a file name that will contain the formatted dump and the CDAT table(s) to dump. It allows inspection of a site's current configuration without having to run the QS Designer. CDATDISP.exe is found in `\qs\exe` and is part of the release.

CDUpdate

This utility is different for each version of the QS system, because its purpose is to update the CDAT information as needed for a particular version of the QS system. The most that can be said in terms of a general design is that CDUPDATE writes questions to the screen, and based on the user's response, opens and modifies CDAT tables. This tool is used to update a site from one QS version to the next.

This utility also allows setting of the site's licenses, setting the IP addresses of workstations and servers and setting the maximum number of users that can connect to the OB Link Web site at a time. CDUpdate will only run on the QSServer (location of the site tables). If the QSServer has an IP address different from the address that is configured in the site tables, CDUpdate can still be run with the standalone parameter:

```
cdupdate standalone
```

The CDUpdate.exe application is located within the `\qs\exe` directory.

Designer

The Designer is the main QS configuration tool. It is a Microsoft Windows-based graphical user interface that allows System Managers to modify the site's configuration to suit the institution's

particular needs, depending on the QS licenses bought (e.g. MAR, Customize).

If the QS system is down, the Designer can still be started on the computer where the site tables reside by making the following entry at a command prompt:

```
designer standalone nocdats opengate node=qsserver (or current server name in the site tables)
```

The Designer.exe application is located within the `\qs\exe` directory.

QSCopy

QSCopy is the utility that is responsible for copying configuration data from a QSServer to a backup server. By default, QSCopy will copy the configuration data once per hour to a computer called BKSERVER. The default copy interval and target computer name can be changed by specifying these two parameters on the command line:

```
QSCopy <target> <interval>
```

where `<interval>` is the copy interval in seconds (default is 3600), target is the computer name of the server the data is copied to.

The QSCopy.bat utility is located within the `\qs\tools` directory.

QSTest

This utility tests the communications to the PDSS, PFILS and PDATS processes running on a system. It has one optional run time parameter `logfile`. With out logfile specified output will give one screen of information per process and will clear the screen between processes. With logfile specified, the output will stream up the screen. With logfile specified, the output can be redirected to a file or printer for review.

QS Tools—Version 6.70.5

Table D-5 is an alphabetical list of files (tools) with a brief description of their intended use. These files are provided within a self-extracting file titled `T6600L14.exe`. All `*.BAT`, `*.TPL`, registry modification files and `*.CMD` files are the property of GE. The majority of the `*.exe` files were provided by the Microsoft Windows NT/2000/2003 Server Resource Kit.

Table 5: Content of the QS Tools File

FILE NAME	WHERE USED	INTENDED PURPOSE
AddFTPUser.bat	NT4/W2k server	Creates the QSFTP account.
ALLACLS.bat	NT4/W2k server	This file uses XCACLS.exe to set the NT permissions on drives D:, E:, F:, and G: (for NT4) and D: (for W2k) to the permissions specified for productions systems.
ATRLS_CV.zip	NT4 Server	Telnet software used for remote support. Requires license purchase for install.
AuditTrail.bat	NT4/W2k server	Used to maintain audit logs on D: or E: to avoid using too much space.
BEEP.exe	Any	Used to create an audible beep through the PC system speaker.
BKServer.tpl	NT4 Server	BKServer.bat template file.
ChangeQSClientService.exe	Client, Loadshare	Used to set the QSClient Service to start in the context of the QS account. This permits access to QSServer resources via NetBios file transfer.
CHOICE.exe	Any	Used to create menu selections in batch files. (i.e. Status.bat)
ClientCFG.bat	Client	Used to extract registry information to a file for troubleshooting.
Clusterkill.vbs	Cluster Server	This is used to terminate QS Server processes on a cluster when Microsoft Windows fails over to the backup node. It periodically checks for presence of `D:\QS` – and if not present executes `killqs.bat`.
Con2prt.exe	Client, Loadshare	Used in Printer.bat to connect to shares on another computer on the network.

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
ConfigServer.bat	NT4 Server	Configures the server for use with the QS. Creates directory structure, sets environment variables and loads registry settings (see QSServerRegistry.txt), installs Telnet, creates and configures user accounts, creates network shares, installs time sync service, sets NT file and directory permissions via ALLACLS.bat, copies Tools.bat and QSI-Cons.tpl to the `D:\qs\release\nt` directory, creates desktop shortcuts (QS Shutdown, QS Status and Command Prompt). This file will require the user to specify, via the command line, the tables to install on the system at the time of execution. The specified tables (filename.zip) will be unzipped to the `D:\qs\site` directory.
Cshell.bat	Any	Used to control error handling for each QS process (Stop, cycle, system reboot, and so forth).
cygwinb19.dll	Any	Provides Unix tool compatibility for NT
DumpEL.exe	Any	Used to retrieve the NT Event Viewer log from a machine for troubleshooting purposes.
EquinoxRegEdit	Loadshare/ Primary Server/ Cluster Server	This is used to turn off auto-detect on the Equinox and Digi serial ports. Microsoft Windows 2000/2003 and above will automatically install a serial mouse when it detects Fetal Serial data on the com ports. The executable turns off auto-detect so that Microsoft Windows does not take over any com ports. This automatically generates a log file in the same directory called `Reg_Enum_log.log`
FixKill.bat	NT4/W2k Client	Corrects the registry setting for the debugger – kill.exe; called by Tools.bat
Fonts.bat	Any	Automates loading of QS fonts on any machine that will run QPM or Designer
Freedisk.exe	NT4/W2k Server	Used in various batch files to check for minimum free hard drive space.
GetQS.txt	NT4/W2k Client, Loadshare	Used by the FTP application to automate retrieval of files from a QSSERVER. Specifies the username and password to connect as and directory where QS files are retrieved. Called out in StartClient.bat
GetQSexe.txt	NT4/W2k Client, Loadshare	Used by the FTP application to automate retrieval of files from a QSSERVER. Specifies the server to connect to, username and password to connect as and directory where executable files are retrieved. Called out in StartClient.bat
GetUpTime.bat	NT4/W2k Server	Creates a zip file containing logs for uptime statistics

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
Grep.exe	Any	Used to search text/log files for specific strings of text.
Gunzip.exe	Any	Zip utility
Gzip.exe	Any	Same as Gunzip.exe
Head.exe	Any	Used to retrieve the first few lines from a text/log file and display it on the screen.
Hidden.exe	Any	Used to hide the task bar application button from users.
IfMember.exe	Any	Checks a user name for group membership.
InstallOBlink.bat	NT4 Server/ Loadshare	Used to prepare the system for OBLink installation. Not for use on Win2k systems.
InstallQS.bat	Client	Uses command line variables to install the QS configuration. Sets the auto-logon user and password.
InstallVNCSetupISS.txt	Any	Installation script for WinVNC. Used by installation batch file.
Instsrv.exe	Any	Used configuration batch files to install a specified service. (i.e. QSSERVER service)
InstallVNC.bat	Any	Used to automatically install WinVNC. Requires SP4 or higher.
Kill.exe	Any	Used to stop processes.
Killqs.bat	Primary Server or Cluster Server	This calls killtree to terminate all QS Server processes.
KillTree.exe	NT/W2k Server	Executable targeted for the cluster server to kill a QS server process and its parent. This is only to be used with QS process started with CSHELL.
Logfile.bat	Any	Used to capture state of system processes and log files – outputs to various files.
Loaddskf.exe	Any	Utility for loading a floppy image from a file saved with Savedskf.exe
MakeBackup.bat	NT4 Server	Convert a QS server to a BK server
MakePrimary.bat	NT4 Server	Convert a BK server to a QS server
NewSID.exe	Any	Executed on a system after applying a “Ghost” image to the hard drive. Generates a unique Security Identifier for the machine.
Now.exe	Any	Displays Date and Time. Used in batch files to log this information.
NTFonts.txt	Any	Installs Fonts
NTPrivs.exe	Any	Used by InstallQS.bat and ConfigServer.bat to modify user privileges

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
OBLINK.VBS	W2K Server/ Loadshare	Used to install configure IIS to support OBLINK on Win2k Servers
OS2Fonts.txt	Any	Installs QS OS/2 Fonts on an NT workstation
Pathman.exe	Any	Add / Delete path variables
Printkey.exe	Client	Used to print the display when the Print Screen key is pressed.
QMIUse.bat	Any	Used to map a drive to a share on another machine. Command line variables are required.
QSAtJobs.tpl	NT4/W2k Server	Renamed to QSAtJobs.bat and called by Config-Server.bat and MakePrimary.Bat to setup scheduled jobs to run at specific times.
QSBackup.bat	NT4/W2k Server	Scheduled to run as an “AT” job by QSAtJobs.bat to backup specific files to a specified backup drive and/or Backup server every 8 hours.
QSChange.bat	NT4/W2k Client	Used to change QSUPDATE and QSBASEPORT environment variable registry settings.
QSClient.tpl	NT4/W2k Client	This file is customized on a per site basis for starting process on specified or generic clients. QSClient.bat resides in **D:\qs\release\nt** on the server.
QSCopy.bat	NT4/W2k Server	Called from QSSERVER.bat to copy backup files to the BKSERVER or other specified location every 3600 seconds.
QSIcons.bat	NT4/W2k Client	Called by QSClient.bat to configure the shortcuts in the Program menu. It will remove older shortcuts if they are found.
QSLocalAccount.bat	NT4/W2k Server	Used by InstallShield on Win2k server for setting privileges.
QSServer.tpl	NT4/W2k Server	Template file that can be renamed to QSSERVER.bat for starting of the QS processes. Resides in **D:\qs\release\nt** on the server.
QSServerRegistry.txt	NT4 Server	Contains registry settings required for QS operation. Called by regini.exe in ConfigServer.bat
QSSrv.exe	Primary Server or Cluster Server	Executable to start up QS Service. This is a replacement to existing srvany.exe for QSServer service. QSServer service calls QSSrv to startup QS Server processes. The executable in turn calls startqs to startup the individual server processes.
QSTimeServ.bat	Client, Loadshare	Creates a new TimeServ.ini file based on the value of QSUPDATE; places in %WinDir%, stops the time service, updates the registry and starts the service again. Will run automatically, upon reboot, if the QSUPDATE variable changes.

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
Qstop.bat	Any	Used to stop QS processes on any machine on the QS network. Requires CDATS to function.
Qsuser.txt	Client, Loadshare	Contains a registry setting that sets the auto-logon user to QSUSER. Called by regini.exe in various batch files. May also be run from the command line with regini.exe to reset the auto-logon user back to QSUSER (not needed on Win2K)
QSWkly.bat	NT4/W2k Server	Scheduled to run as an “AT” job by QSAtJobs.bat to backup specific files to a specified backup drive and/or Backup server on a weekly basis.
Rclient.exe	Any	Used primarily by Tech Support for remote command line abilities. Runs as a service. See **Rsetup.exe** for installation information.
Rconmode.exe	Any	Enables you to change the screen buffer size and the window size of the current console. The syntax is: rconmode bufferx,buffery,windowx,windowy Where: bufferx is the screen buffer width in characters. buffery is the screen buffer height in characters. windowx is the window width in characters. windowy is the window height in characters. For example, the following command changes the screen buffer size to 80 x 500 and the window size to 80 x 50: rconmode 80,500,80,50
Rconmsg.dll	Any	Rconsole file
RconStat.exe	Any	Lists all current remote console connections
Rconsvc.exe	Any	Used to control services on a remote machine.
Rcruncmd.exe	Any	Used to run programs /executables on a remote machine.
Reg.exe	Any	Registry query and modification tool.
RegDmp.exe	Any	Utility for dumping specified registry information to a file.
Regini.exe	Any	Used to process text files that contain registry settings. Inserts the contents of the text file in to the registry.
RoboCopy.exe	Any	Used to synchronize files between networked computers.
Rsetup.exe	Any	Locally or remotely install Remote Console service. (rsetup <computername>)

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
SaveDskf.exe	Any	Used to create exact duplicate floppy image files that can be loaded to other floppies using LOADDSKF.exe.
SC.exe	Any	Utility to obtain detailed information about Microsoft Windows NT services
SetNetBIOSTransfer.BAT	Any	Calls ChangeQSClientService.exe to modify the QSClient Service to use the QS account and new password; Sets METHOD=NET.
Shortcut.exe	Any	Used to create shortcut links to programs. Called by ConfigServer.bat and QSIcons.bat
Shutdown.exe	Any	Used to shutdown or reboot the local or remote windows computer
Sleep.exe	Any	Used to delay batch file progression. Stops progression by specified number of seconds.
Srvany.exe	Any	Used to start QS processes via a specified service.
SrvMgr.exe	Any	Used to remotely manage services and shares.
StartClient.bat	Client, Loadshare	Called by the QSClient service to configure and load the QS client software.
Startdes.bat	Client, Loadshare	Used to start the designer after other necessary QS process have completed.
StartQPM.bat	Client, Loadshare	Used to start QPM after other necessary QS processes have completed
StartQS.bat	NT4/W2k Server	Called by the QSSERVER service to set/verify the system configuration and start QS processes via QSSERVER.bat. If run on a Cluster server it will stop QS processes, via Killtree.exe, that may be running before attempting to start them again.
Status.bat	Server	Used to display a menu of processes. Menu selections will cause the status of the process to be displayed on the screen.
StopQS.bat	Any	Attempts to stop all possible QS processes on the machine it is run on. Similar to Qstop.bat which only stop processes found running.
Stub.exe	Any	QS Icon file associated with QS programs. Changes the default icon to that of the QS Icon. Called out in ConfigServer.bat and QSIcons.bat for use by shortcut.exe
Tail.exe	Any	Used to display the last few lines of a text/log file. Dynamically displays entries to the file as they are appended.

Table 5: Content of the QS Tools File (Continued)

FILE NAME	WHERE USED	INTENDED PURPOSE
Timeserv.client	Client, Loadshare	Template file used with Timeserv.exe for synchronizing the computer clock with the QS server. Edit this file to change the time source / connection method used by the computer.
TimeServ.dll		Required for function of TimeServ.exe
TimeServ.exe	Any	Installed as a service by ConfigServer.bat, ConfigWS.bat and InstallQS.bat. Synchronizes the computer clock with an outside source on a scheduled basis.
TimeServ.server	NT4/W2k Server	Template file used with Timeserv.exe for synchronizing the computer clock with an outside source. Edit this file to change the time source / connection method used by the computer.
Tlist.exe	Any	Used to show a list of running programs on a computer.
Tools.bat	Client, Loadshare	Automatically installs/re-installs the tools version. Uses the version specified in Version.bat or hard coded version if not set by Version.bat. Creates flag file when complete. NOTE: New tools are copied to the workstation only when the release file is not found in \qs\exe.
Unzip.exe	Any	Used to un-compress files that have been compressed using Zip.exe
Unzipsfx.exe	Any	Unzip tool
Vnc333r9.zip	Any	Compressed file containing the WinVNC application that may be setup on a computer to provide remote desktop viewing.
VNCset.reg	Any	Registry settings for auto VNC install via INSTVNC.BAT
Xcacls.exe	Any	Used to edit or view NTFS permissions.
Zip.exe	Any	Used to compress the size of a file or files. Reduces storage space required and accelerates uploading/ downloading of files.

Chapter 2: Process Control & Status

The dialog box in Figure 2-12 is used to issue administrative commands to QS processes. These processes allow users to view specific process status and set process operational parameters. The as-delivered configuration of the QS system makes this dialog box available via the Network menu Commands option; however, QS System Managers at configurable sites may use QS Designer to assign the Network Commands action to any navigator element. The various control elements of this dialog box are summarized in Table 6, “Network Commands Dialog Box - Component Descriptions,” on page 52.

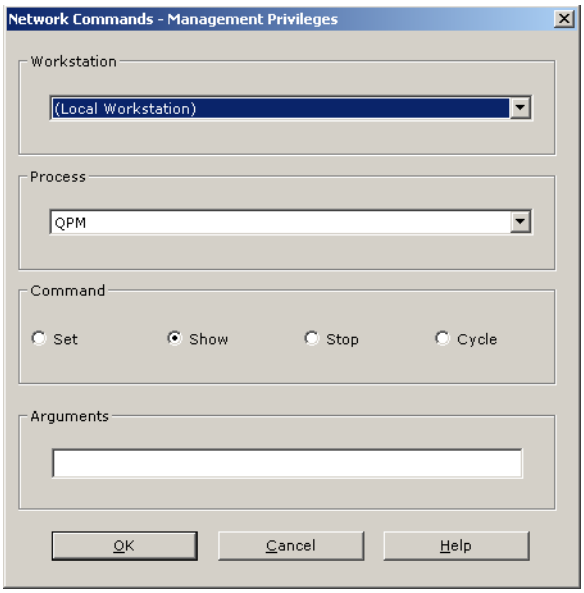


Figure 2-12: Network Commands Dialog Box

Table 6: Network Commands Dialog Box - Component Descriptions

Control/Element	Description
Workstation	Allows you to specify which workstations that the dialog box will be accessing/controlling. You may select any workstation configured as part of the QS, the current (local) workstation or all workstations as the focus of the action or status check being requested.
Process	Allows you to select the specific process of interest. Each of the process options is described in the paragraphs that follow this table.
Command	Allows you to select one of four radio buttons to indicate the preferred action to be performed - **Set**, **Show**, **Stop**, and **Cycle**. **Set** - Allows you to change the operational parameters of the selected process on the specified workstation(s). **Show** - Allows you to view status (statistics) of the selected process on the specified workstation(s). **Stop** - Causes the selected process to cease operation. In general, this option should not be used unless directed by a member of QS Customer Support. Questions should be directed to the QS Help number listed within this document. The use of arguments is not appropriate for this command. **Cycle** - Allows you to stop and restart the selected process. It is generally used after the QS configuration has been modified by a QS System Manager. If you are unfamiliar with the cycling of processes, please contact QS Customer Support for directions. **Note**: The cycle command will only work if the QS is operating under CShell. Otherwise, the process will stop and not restart. The typical QS installation uses CShell.
Arguments	QS process commands may be defined in greater detail through appropriate entries in the **Argument** field. Arguments appropriate for the various QS processes are described in “Process Arguments” on page 53.

QS Processes

The following processes may be controlled using the Network Commands dialog box.

- ARCHIVE
- LAS
- PTD
- BRelay
- LOGS
- QPM
- CDATS
- PDATS
- QS Connect

- CDSS
- PDSS
- SPP
- HIS-HL7
- PFILS
- HIS-HL7O
- PMS

Process Arguments

Users may specify operational parameters (referred to as arguments) that control the performance of either a set or show command. Since arguments vary from process to process, each command available for use with each QS process is described within the following appropriately labeled paragraphs. Users may also view the arguments available for each command by entering `Help` into the argument field with either the `Set` or the `Show` command.

Please note that arguments are not used in conjunction with the **Stop** command.

Archive Arguments

If a termination admin command (stop, cycle, cycle with reboot) is received, Archive will delay termination until the current archival process is complete.

SET

`VERBOSE=TRUE` causes ARCHIVE to log and show INFORMATIONAL messages.

`VERBOSE=FALSE` causes ARCHIVE to ignore INFORMATIONAL messages.

`ARCHIVE` causes the immediate archival of data to CD-R unless the server is in a HOLD state.

`HOLD` prevents patient file preparation and archival until a RESUME command is received or the Archive server is rebooted.

`INTERVAL=mm` sets the minutes between periodic passes for file preparation and potential archival. `mm` must be from 1-1440. If =mm is not specified, an interval will be triggered without writing to CD-R, unless TIME_SPAN or MB_DATA criteria are met.

`MB_DATA=bb` sets the megabytes of data in the staging area that will trigger archival to long term storage media. bb must be from 2-600.

`TIME_SPAN=dd` sets the number of days since the last archive that will trigger archival to long term storage media. dd must be from 1-365.

RESUME permits Archive to process data when the next interval expires.

SHOW

STATUS presents the standard server screen.

STATUS=SUMMARY provides a translatable (internationalizable) summary of the Archive status. This information can be requested on demand by user via QPM. QPM sends this admin command to Archive and puts the resulting text in a message box.

BRelay Arguments

SET

CHALKBOARD=FALSE causes Chalkboard messages NOT to be broadcast.

FETALWAVE=TRUE causes FetalWave messages to be broadcast.

FETALWAVE=FALSE causes FetalWave messages NOT to be broadcast.

GATEKEEP=TRUE causes Gatekeeper messages to be broadcast.

GATEKEEP=FALSE causes Gatekeeper messages NOT to be broadcast.

HEARTBEAT=TRUE causes Heartbeat messages to be broadcast.

HEARTBEAT=FALSE causes Heartbeat messages NOT to be broadcast.

LOCATOR=TRUE causes Locator messages to be broadcast.

LOCATOR=FALSE causes Locator messages NOT to be broadcast.

NOTIFY=TRUE causes Notification messages to be broadcast.

NOTIFY=FALSE causes Notification messages NOT to be broadcast.

TIME=TRUE causes Time Synchronization messages to be broadcast.

TIME=FALSE causes Time Synchronization messages NOT to be broadcast.

WATCHDOG=TRUE causes WatchDog messages to be broadcast.

WATCHDOG=FALSE causes WatchDog messages NOT to be broadcast.

ALLMSG=TRUE causes all received messages to be broadcast.

ALLMSG=FALSE causes all received messages NOT to be broadcast.

RESETCOUNT resets the Process Status screen counts.

VERBOSE=TRUE enables informational message logging.

VERBOSE=FALSE disables informational message logging.

SHOW

STATS shows the current QS statistics.

STATUS shows operational information about BRelay. This is the default SHOW option.

CDATS Arguments

SET

`BACKUP=[Filename]` will BACKUP to current working CDAT tables and place them in a compressed file with the given filename in the CDATBACK directory.

`BASEHOUR=HH` sets the starting hour for verify passes hour. HH must be a value from 0 to 23.

`INTERVAL=MM` sets the minutes between periodic verify passes. MM must be 60, 120, 180, 240, 360, 480, 720 or 1440.

`LOCK=TRUE` creates a CDAT.LCK file and holds all updates

`LOCK=FALSE` deletes the CDAT.LCK and allows CDAT updates to be resumed

`MODIFY=HOLD` holds all CDAT updates

`MODIFY=RESUME` allows CDAT updates to be resumed

`NEWLOGS` closes the current log files and opens new ones.

`RESTORE=[filename]` restores a compressed file of CDAT tables from the CDATBACK directory and places them in use.

`UPDATE` forces a save of the current CDAT tables by copying .000 to .001, .001 to .002, and so forth

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

`VERIFY` initiates verification of the CDAT tables.

SHOW

`INFO` displays the path of the CDAT tables, and summary information on each CDAT table version.

`STATS` displays the current CDATS metrics and QS statistics.

`STATUS` shows operational information about STATUS.

CDSS Arguments

SET

`BASEHOUR=x` sets hour of the day that the verify interval is started on. The valid range for 'x' is 0 to 23.

`INTERVAL=x` sets the minutes between periodic verify passes. The valid entries are 60, 120, 180, 240, 360, 480, 720 or 1440.

`SETSELECTPT=PtId` signifies that a patient has been selected by a QPM.

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

`VERIFY[=PtId]` initiates an immediate verify pass. The patient to verify may optionally be specified.

SHOW

ACTIVE shows the active CDSClient workstations.

DUMPCACHE[=PtId] shows Cached data. If no patient ID is given, the patients cached will be displayed. If a patient ID is given, the items stored for that patient are displayed.

STATS returns the current QS statistics.

STATUS shows operational information about CDS.

HIS-HL7 (Inbound) Arguments

SET

ADT=TRUE enables ADT processing.

ADT=FALSE disables ADT processing.

FLUSH=TRUE disables all HL7 processing. Use with EXTREME CAUTION!!! A number of transactions to FLUSH may be specified instead of TRUE.

FLUSH=FALSE re-enables HL7 processing.

LAB=TRUE enables LAB processing.

LAB=FALSE disables LAB processing.

NEWLOG closes the current log file and opens a new one.

ORDER=TRUE enables Order processing.

ORDER=FALSE disables Order processing.

TRACE=TRUE enables ComPort tracing on the HL7 Lower Level Protocol.

TRACE=FALSE disables ComPort tracing.

TXACT=TRUE enables transaction logging.

TXACT=FALSE disables transaction logging.

VERBOSE=TRUE enables informational message logging.

VERBOSE=FALSE disables informational message logging.

HIS-HL7O (Outbound) Arguments

SHOW

STATS will display the current metrics and QS statistics.

STATUS shows operational information about STATUS.

SET

NEWLOG closes the current log file and opens a new one.

ROUTER=TRUE enables Results to be transmitted.

ROUTER=FALSE disables Results to be transmitted.

SERVER=TRUE enables Outbound requests.

SERVER=FALSE disables Outbound requests.

TXACT=TRUE enables transaction logging.

TXACT=FALSE disables transaction logging.

VERBOSE=TRUE enables informational message logging.

VERBOSE=FALSE disables informational message logging.

LAS Arguments

SET

DATA[=ALL | ADT | LABDIR | LABDATA | LABNOTE | RWHAT] enables data logging on the type of data selected. If none of the optional data types is specified, ALL is logged.

[NO]DEBUGMODE enables or disables debug data logging.

NODATA[=ALL | ADT | LABDIR | LABDATA | LABNOTE | RWHAT] disables data logging on the type of data selected. If none of the optional data types is specified, ALL is logged.

VERBOSE=TRUE enables informational message logging.

VERBOSE=FALSE disables informational message logging.

SHOW

MLIST[=IP_ADDRESS] returns the current entries in the monitor list. The IP address of the monitor to list may optionally be specified.

STATS returns the current QS statistics.

STATUS shows operational information about CDS.

LOGS Arguments

SET

NEWLOGS closes the current log file and opens a new one.

NEWSTATS closes the current stat file and opens a new one.

SHOW

STATS returns the current QS statistics.

STATUS shows operational information about LOGS.

PDATS Arguments

SET

METRICS=NN sets the per slot performance metrics interval to the specified value (in minutes). NN must have a value between 1 and 1440, inclusive.

RESET METRICS resets (zeros) the total performance metrics.

VERBOSE=TRUE enables informational message logging.

VERBOSE=FALSE disables informational message logging.

SHOW

`PATIENT=PTID` shows detailed information on the specified patient(s). Wildcard characters of '*' and '?' may be used in the PTID.

`SLOTS[=start-stop]` shows the patients in the specified slots.

`STATS` shows the current PDATS metrics and QS statistics.

`STATUS` shows operational information about PDATS.

`TABLES` shows the CDAT tables in use.

PDSS Arguments

SET

`BASEHOUR=HH` sets the starting hour for verify passes hour. HH must be a value from 0 to 23.

`INTERVAL=MM` sets the minutes between periodic verify passes. MM must be 60, 120, 180, 240, 360, 480, 720 or 1440.

`LOAD=PtId[@Workstation]` loads the specified patient in PDATS. The workstation to load the patient at may optionally be specified.

`NEWLOGS` closes the current log files and opens new ones.

`PURGE=PtId` deletes the specified patient from the system!!!

`RESTORE=PtId@Workstation` restores the specified patient. The patient's data must reside in the PFILS directory on the specified workstation.

`UNLOAD=PtId` unloads (drops) the specified patient from PDATS.

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

`VERIFY[=PtId]` initiates an immediate verify pass. The patient to verify may optionally be specified. If '*' is specified, a verify on ALL patients will be initiated.

SHOW

`BEDMAP` shows the patient ID for each occupied bed.

`PATIENTS WHERE CRITERIA=VALUE[, CRITERIA=VALUE][, FULL]` shows roster information for selected patients. One or more selection criteria may be specified. Criteria are logically ORed. Valid criteria are: ATTEND, BED, GROUP, ID, INFO, NAME, PDATS, PFILS, SERVICE, UNIT. Selected information for each patient will be shown unless FULL is specified.

`PATIENTS ALL[FULL]` shows roster information for all patients. Selected information for each patient will be shown unless FULL is specified.

`PDATS` shows MAX, USED, and FREE slots for each PDATS.

`PFILS` shows the number of patients served and disk space available for each PFILS.

PTDELTA=ID shows the current PtDelta values for the given Patient ID.

STATS will return the current QS statistics.

STATUS shows operational information about PDSS.

TABLES shows the CDAT tables in use.

PFILS Arguments

SET

BASEHOUR=x sets hour of the day that the verify interval is started on. The valid range for 'x' is 0 to 23.

BCACHE=# sets the number of backup file handles to be cached. The range must be between 10 and 1024 inclusive.

COPY=PTID>FILENAME causes PFILS to copy the patient record to the specified file.

DROP=PTID causes PFILS to end serving the patient PTID. May be suffixed with the modifier /BINARY to force a binary (non-text) return code. May be suffixed with the modifier /RENAME to cause PFILS to end serving the patient PTID and rename the data file, or with the modifier /DELETE to cause PFILS to end serving the patient PTID and delete the data file.

INTERVAL=x sets the minutes between periodic verify passes. The valid entries are 60, 120, 180, 240, 360, 480, 720 or 1440.

PCACHE=# sets the number of primary file handles to be cached. The range must be between 60 and 6144 inclusive.

REENUMERATE removes patients from the Work List that there are not any files for them. Initiates service for patients that are not in the Work List.

SERVE=PTID causes PFILS to begin serving the patient PTID. May be suffixed with the modifier /BINARY to force a binary (non-text) return code. May be suffixed with the modifier /CREATE to cause PFILS to create the data file and begin serving the patient PTID.

VERBOSE=TRUE causes PFILS to log and show INFORMATIONAL messages.

VERBOSE=FALSE causes PFILS to ignore INFORMATIONAL messages.

VERIFY[=PtId] initiates an immediate verify pass. The patient to verify may optionally be specified.

ZEROASTATS resets the total Append Statistics to zero.

ZEROCSTATS resets the Cache Hit/Miss Counts to zero.

SHOW

ASTATS returns the current append performance statistics.

CSTATS returns the current cache performance statistics.

`HSTATS` returns the current work list hashing distribution statistics.

`MSTATS` returns the current Merge statistics.

`PATIENT=PTID[/BINARY]` returns a list of detailed information on the given patient.The wildcard characters of '*' and '?' may be used in the PTID. BINARY will cause PFILS to respond to the SHOW command in an internal format useful only to PFILSC.

`SLOTS=[start-stop]` returns a list of patients in the Work List in the range of slots given.

`STATUS` returns the current Process Status. This is the default SHOW option.

`STATS` returns the current QS statistics.

PMS Arguments

SET

System Modes

`/[NO]CHECKSKEW` enables/disables checking for skewing on monitor timestamps.

`/[NO]MISSEDSTORE` enables/disables missed storage interval processing.

`/[NO]STOREALARMS` enables/disables storing data when the monitor is in alarm.

`/[NO]VERBOSE` enables/disables informational message logging.

NOTE: For the following stored procedure parameters, x can have any of the following values: ALL, NONE, ECG, VITALSIGNS, TEMPERATURE, OXYGENATION, VENTILATOR, CARDIACCALCS, FIXED, FETALMONITORINGA + sign can be used to combine the options. The default value is ALL.

`/STPROCABG=x` sets what PMS item types to store when the Arterial Blood Gas stored procedure is stored.

`/STPROCCO=x` sets what PMS item types to store when the Cardiac Output stored procedure or Cardiac Calculations are stored.

`/STPROCPC=x` sets what PMS item types to store when Pulmonary Cardiac Calculations are stored.

`/STPROCNBP=x` sets what PMS item types to store when the NIBP stored procedure is stored.

`/STPROCWP=x` sets what PMS item types to store when the Wedge Pressure stored procedure is stored.

`SYNC ?` shows a summary of Unity Time Sync commands and parameters

`SYNC=[0, 1, or 2]` 0 disables Unity time master synchronization. 1 enables Unity time master synchronization. 2 performs a one-time immediate time sync with the Unity network.

SYNCTIME=[0000..2359] sets the time of day at which the server synchronizes its time with the Unity network.

SYNC_QUOTA=[0..255] sets the maximum number of times per day synchronization takes place.

SYNC_DRIFT=[1..255] sets the maximum time difference allowed between QSServer and Unity network time master before synchronization takes place.

Per Acquire

/ACQUIRE=Name Selects the Acquire task that you want to control.

/NEWLOG Cycles the current message log file for the selected Acquire task.

/[NO]DATA Enables/disables data logging on the selected Acquire task.

/[NO]TRACE Enables/disables ComPort tracing on the selected Acquire task.

Per Bed

/BED=Name selects the Bed that you want to control.

/ACK acknowledges a notification on the selected Bed.

/[NO]DATA enables/disables data logging on the selected Bed.

/[NO]NOTIFY enables/disables notifications on the selected Bed.

/HI=LIMIT, DURATION, RECOVERY, RESET changes Hi settings on the selected Bed.LIMIT range is 30 to 240 bpm and Hi must be at least 10 greater than Lo. DURATION/RECOVERY range is 1-600 seconds, RESET range is 1 to 3600 seconds.

/LO=LIMIT, DURATION, RECOVERY, RESET changes Lo settings on the selected Bed.LIMIT range is 30 to 240 bpm and Hi must be at least 10 greater than Lo. DURATION/RECOVERY range is 0-120 seconds. RESET range is 1 to 3600 seconds.

/PEN=DURATION, RECOVERY, RESET changes Penlift settings on the selected Bed.LIMIT range is 30 to 240 bpm and Hi must be at least 10 greater than Lo. DURATION/RECOVERY range is 1-300 seconds. RESET range is 1 to 3600 seconds.

/TACHY=VALUE changes Tachycardia MHR setting on the selected Bed.

/BRADY=VALUE changes Bradycardia MHR setting on the selected Bed.

/[NO]NOTIFY enables/disables notifications on the selected Bed.

/[NO]MATERNAL enables/disables maternal-only mode on the selected Bed.

Beds with Serial Fetal Monitor Acquire

`/[NO]TRACE` enables/disables ComPort tracing on the selected Bed. TRACE may be enabled for only one FM Serial bed per workstation at any time.

`/CLOSEFMPORT` closes the serial port to the bed's monitor.

Per Bed/Acquire

`/BEDACQUIRE=BedName,AcquireName` specifies the Bed-Acquire you want to control.

`/[NO]DATA` enables/disables data logging on the selected Bed-Acquire.

`TENERRORS=mm` sets PMS to cycle if ten store errors occur in mm minutes. The default is to set mm to zero which disables cycling on store errors.

SHOW

(no parameters) gives standard info.

`/ACQUIRE=Name` selects the Acquire task(s) that you want to check by specifying the name of the acquire task (e.g. SerialFM). If no acquire tasks are specified, status for all tasks will be displayed.

`/BED=Name` selects the Bed(s) that you want to check by specifying the bed name(s). If no bed names are specified, status on all beds will be displayed./BED=Name displays status for ALL acquires for the bed.)

`/BEDACQUIRE=BedName,AcquireName` selects the particular bed/acquire combination that you want to check.

`/DATA=Name` displays cached parameter data for the specified bed.

`/STATS` displays QS statistics.

PtD Arguments

SET

Supports the following: Help, Interval, InvalidNumber, NewLog and Verbose. Only one command may be specified at a time.

ASCII Export only

`INVALIDNUMBER=TEXT` invalid number is exported as text string.

`INVALIDNUMBER=NULL` invalid number is exported as null value.

`INTERVAL[=minutes]` wakes up PtD and optionally changes the schedule interval to the specified minutes.

`NEWLOG` closes the current log file and opens a new one.

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

QPM Arguments

CYCLE

(no parameters) cycles the QPM application.

`REBOOT` restarts the workstation

SET

`/[NO]VERBOSE` enables/disables informational message logging.

SHOW

(no parameters) gives standard info.

`STATS` provides statistics info.

`BEDMAP` provides a list of the current Bed/Patient map.

`ALL` provides both info and statistics.

QSConnect Arguments

SHOW

`STATS` returns the current QS statistics.

`STATUS` shows operational information about QSConnect.

SET

`NEWLOGS` closes the current log files and open new ones.

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

`CONNECT=ConnectName/SetCommand` passes the SetCommand to the specified ConnectName

Valid SetCommands are:

- `START` initiates the specified ConnectName.
- `STOP` terminates the specified ConnectName.
- `PAUSE` temporarily suspends the specified ConnectName.
- `RESUME` restarts the paused ConnectName.
- `DATA=ON` initiates data logging on the connect.
- `DATA=OFF` terminates data logging on the connect.
- `TRACE=ON` initiates trace logging on the connect.
- `TRACE=OFF` terminates trace logging on the connect.
- `FLUSH=TRUE` enables data collection by the connect.
- `FLUSH=FALSE` disables data collection by the connect.
- `VERBOSE=TRUE` enables informational message logging.
- `VERBOSE=FALSE` disables informational message logging.

SPP Arguments

SHOW

`STATS` returns the current QS statistics.

`STATUS` shows operational information about SPP.

SET

`NEWLOGS` closes current log files and opens new ones.

`VERBOSE=TRUE` enables informational message logging.

`VERBOSE=FALSE` disables informational message logging.

`START` initiates the next job running if it is scheduled to run today

Chapter 3: Network Architecture

The QS uses two types of networks for communication. First is the communication between the QS server and its clients. Second is the collection of serial patient-monitor data by the QS Patient Monitoring System (PMS) server.

The QS server and its clients communicate using Transport Control Protocol / Internet Protocol (TCP/IP) via CAT5/6 (copper) and fiber optic media. The system can function on a Local Area Network (LAN), Metropolitan Area Network (MAN) or Wide Area Network (WAN). WAN configurations can use various connections such as a dedicated T1 line (1.544 megabit/sec) for a small remote office with 5 to 10 workstations or a T3 line (45 megabit/sec) to connect two hospitals together on one system.

Most WAN and some MAN configurations require the use of a loadshare server. The loadshare server's purpose is to mitigate latency and reduce broadcast traffic over connections where latency may be a problem or when broadcast traffic could be interrupted.

Many types of patient monitors exist, and they transmit patient data in many different forms (protocols) and speeds (baud rates). Fetal monitors typically feed the PMS process through serial connections either to an Equinox box, which encapsulates the data and sends it to the server over Ethernet using IP, or to a Digi concentrator that is physically attached to an adapter in the server (Digi concentrators have been replaced with the Equinox box on new systems). Other monitors, such as the Dash and Solar monitors, communicate with the PMS server using IP on their own network (Unity) and a separate network card in the server.

What would you like to learn about?

- Network Performance (page 65)

Network Performance

Network performance is a function of the amount and availability of bandwidth (the amount of data that can be transmitted per unit of time), which ultimately affects latency as well. Most new networks being installed today use 100 megabit communication to the desktop and gigabit communication between network devices. Most servers sold today also support gigabit speeds.

When installed in a LAN or MAN, clinical performance requirements often dictate that the QS be put on its own network or VLAN to isolate the system from the existing Hospital network traffic. The purpose of putting computers on VLANs is to segment portions of the network into different broadcast domains.

Broadcasts in a VLAN are not sent to other VLANs by routers, thus reducing the overall broadcast (UDP) traffic on the network. Use of VLAN technology keeps the QS broadcast traffic off the hospital

network which accomplishes two things: reduces the overall broadcast traffic on the rest of the network (and vice versa) and decreases the chance that the QS broadcast traffic will be interrupted by other network traffic.

VLANs also allow computers in different physical locations to be in the same network/broadcast domain as though they were plugged into the same switch. VLAN technology works very well in small to medium network environments but is less desirable in large networks due to the time it takes for changes in network topology to be communicated to all network devices.

If a broadcast message is interrupted (collides with another message), the broadcast message is lost and will not be retransmitted. Since the QS uses broadcast messages for both active fetal strip display and chalkboard updates, any interrupted broadcast traffic would not reach the workstations for display in QPM. Data processed by PMS is broadcast on the network for display on workstations running QPM. The same data that is being broadcast to the QPM workstations is being sent to the primary QS server via TCP/IP for storage in the patient record. If yellow bars are being displayed in QPM but not being stored in the patients record (stored strip), it is an indication that the broadcasts are not reaching their destination. If the same bars are being displayed in both stored and active strips, it is an indication that there are communication problems between the serial device (fetal monitor) and serial concentrator (Equinox or Digi) or between the serial concentrator and the PMS server.

What do you want to learn about?

- Fetal Monitor Communication (page 67)
- Equinox Equipment (page 69)
- Digi Equipment (page 75)
- QS Traffic (page 77)
- Local Area Network (page 79)
- Wide-Area Network (page 80)
- Network Recommendations (page 81)
- Network Configuration: Information and Guidelines (page 82)
- Vendor Access to the QS System (page 94)
- Interfaces (page 95)
- IP Communication: Network Traffic (page 96)
- The QS System and the Hospital Network Environment (page 97)
- Unity Equipment (page 97)
- NT Issues (page 99)

Fetal Monitor Communication

Most fetal monitors send data over serial connections. Sometimes intermediate hardware, such as the SADC for certain Hewlett-Packard monitors, is needed but the basic approach is the same for all. Wired serial connections are run from the monitors to a concentrator; either Equinox or Digi.

The concentrator gathers the output from multiple monitors and relays it on the QS PMS process. A Digi concentrator delivers serial data over a dedicated line to the Digi PCI adapter card in the PMS server. An Equinox concentrator encapsulates the serial monitor data and passes it via Ethernet to the PMS server.

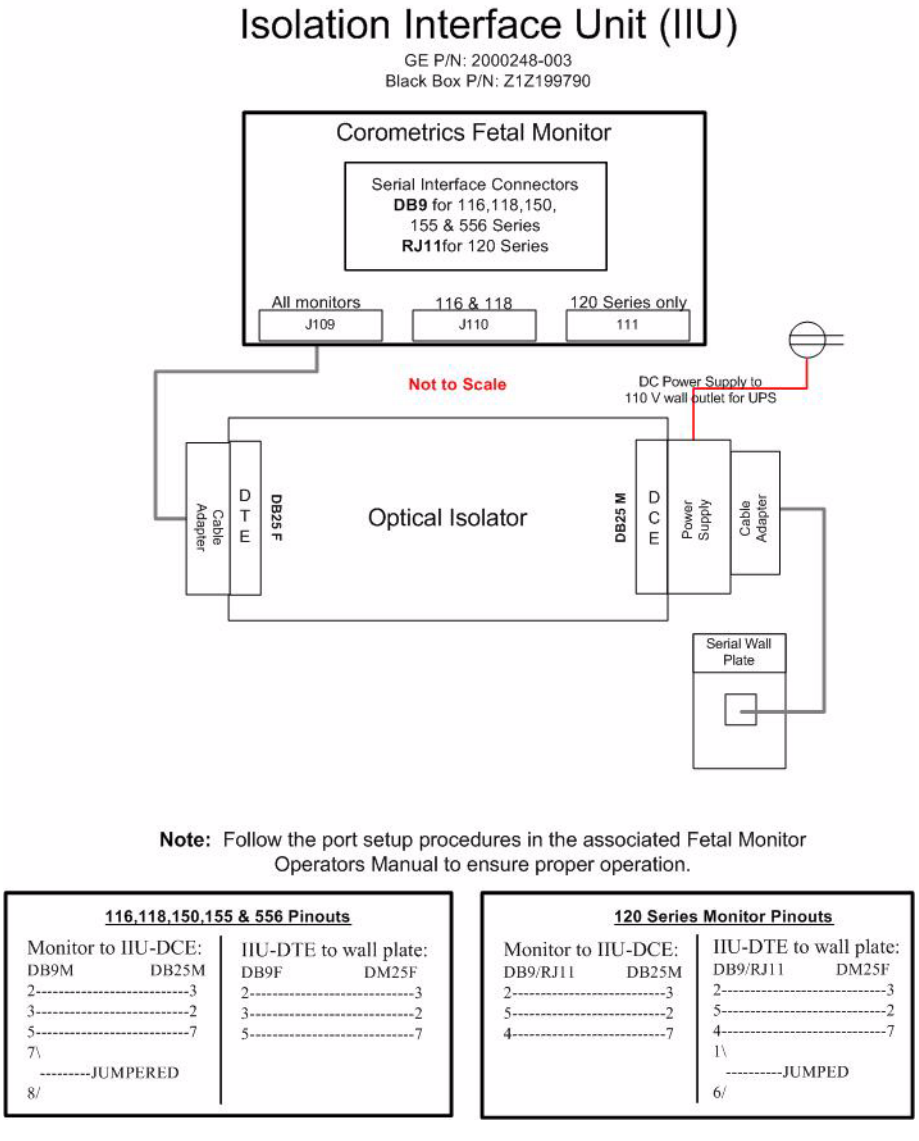


Figure 3-13: Old Isolation Interface Units

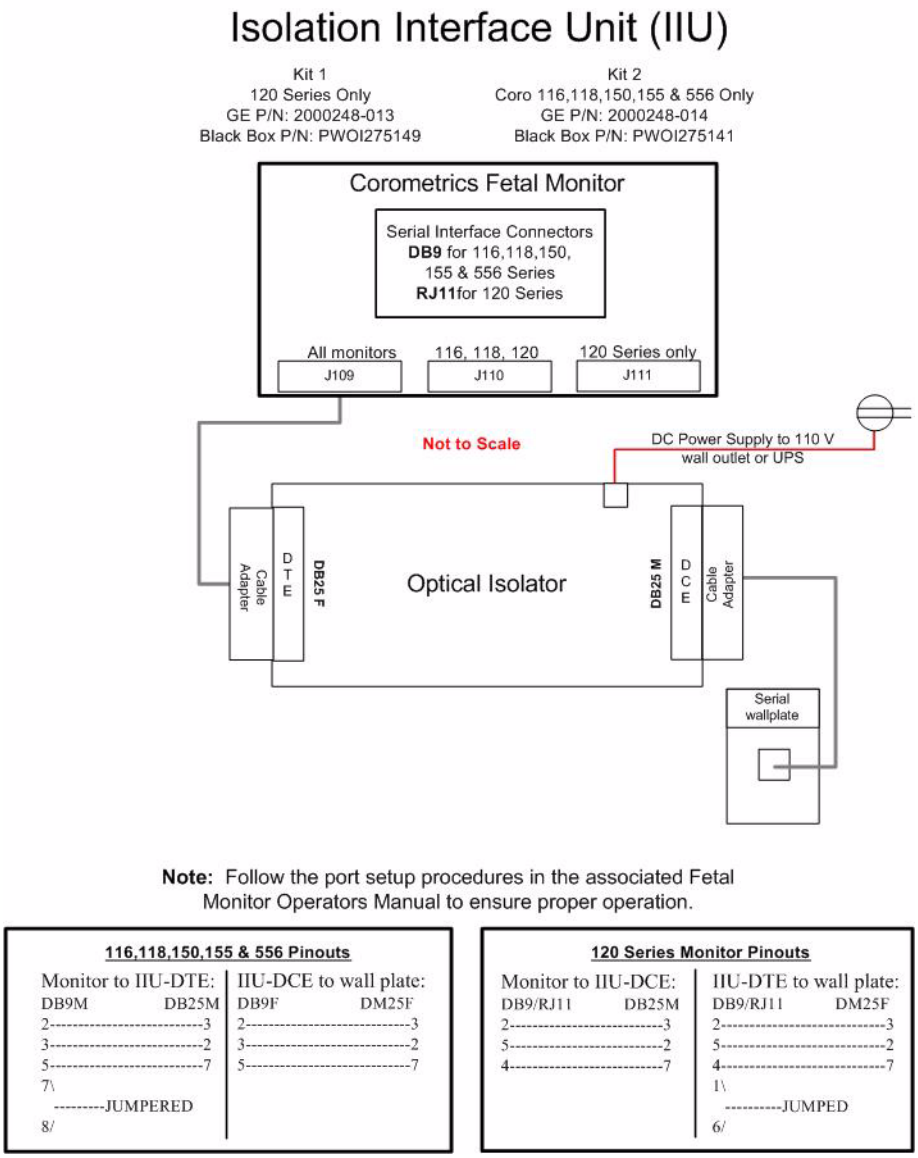


Figure 3-14: New Isolation Interface Units

Equinox Equipment

The QS PMS process collects data from the fetal monitors via serial input. The Equinox ESP-16 is a 16-port terminal server that will allow data streams from 16 fetal monitors to be directed back to the PMS process via its 10/100BaseT Ethernet port. Multiple serial concentrators may be used as needed.

The cabling requirements for the serial side (between the fetal monitors and the Equinox) are the same as those listed for the Digi concentrator, with the added capability of CAT6 cable usage on Equinox-based systems. The Ethernet side of the Equinox box is a standard 10/100BaseT half-duplex connection. Once the Equinox is connected to the network, distance and data rate is limited only by Ethernet network standards (IEEE 802.3).

The following figures describe connection options for the various Equinox hardware options.

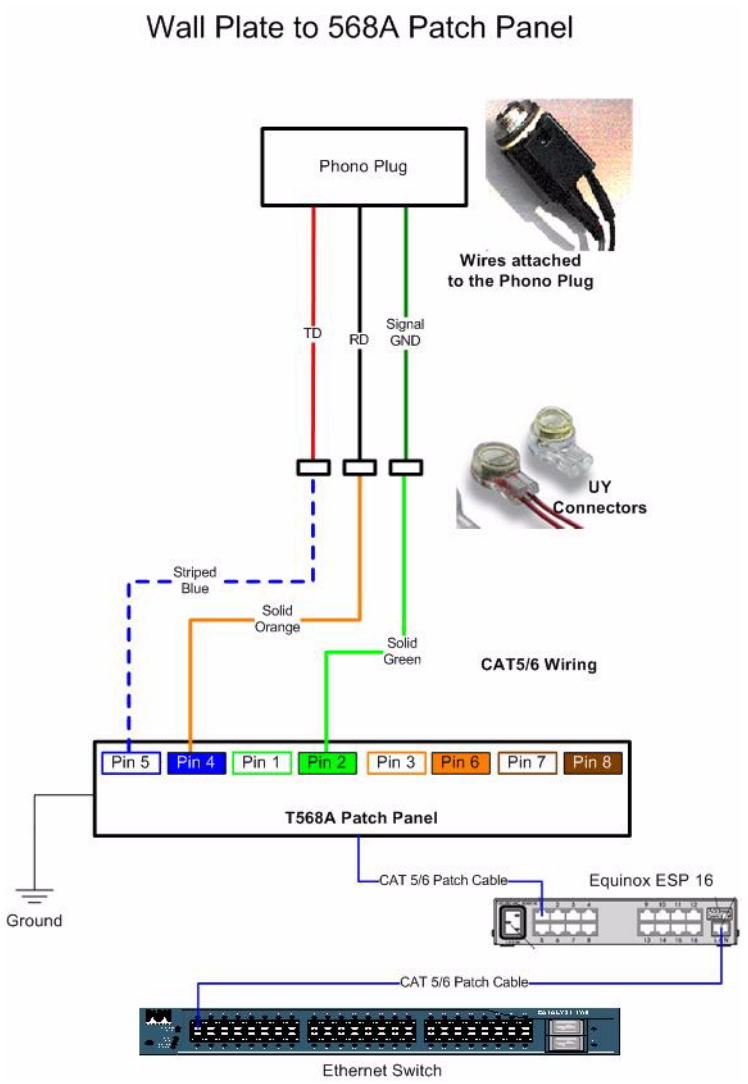


Figure 3-15: Wall Plate to Patch Panel 568A (Equinox)

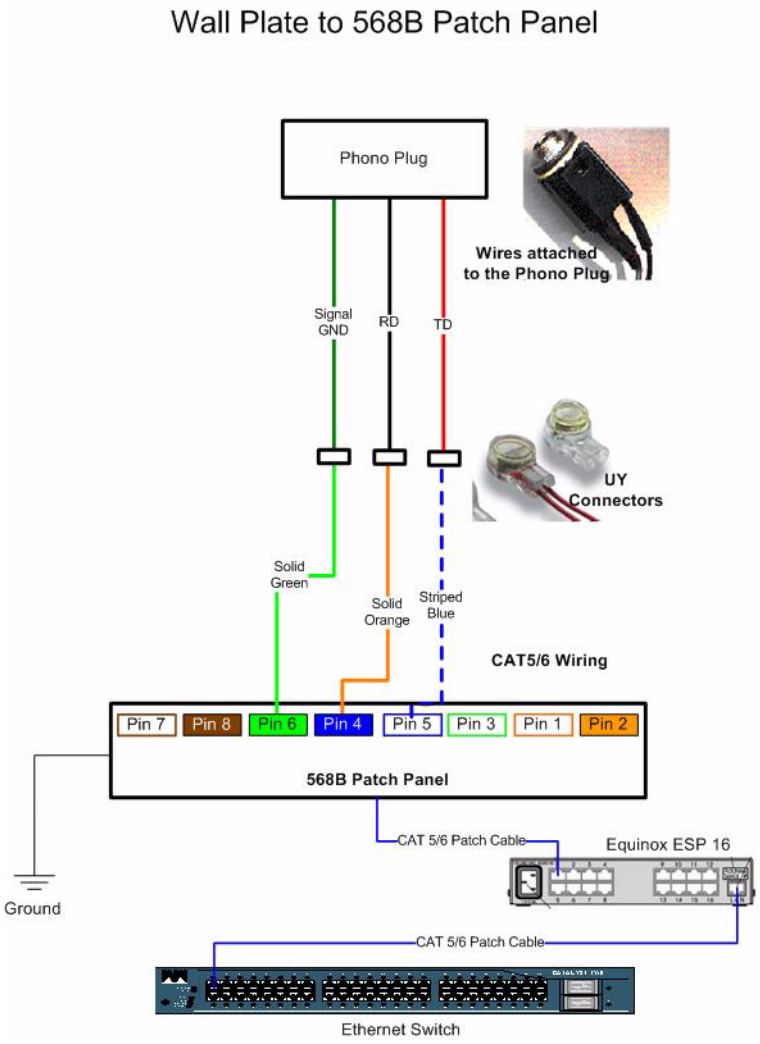


Figure 3-16: Wall Plate to Patch Panel 568B (Equinox)

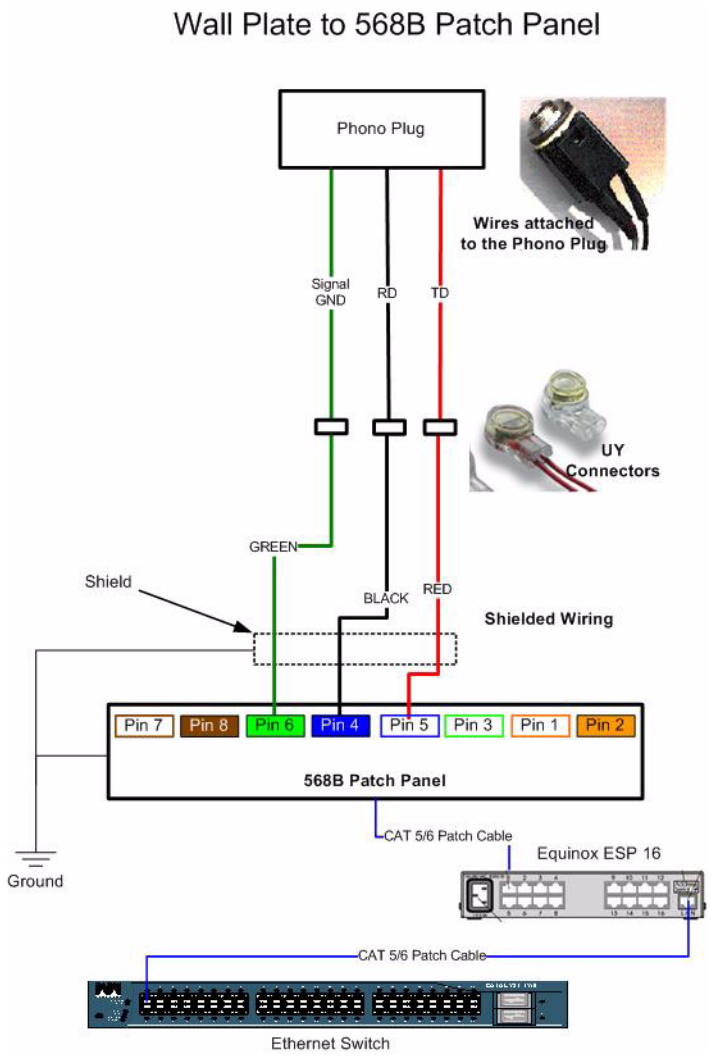


Figure 3-17: Wall Plate to Patch Panel 568B Shielded (Equinox)

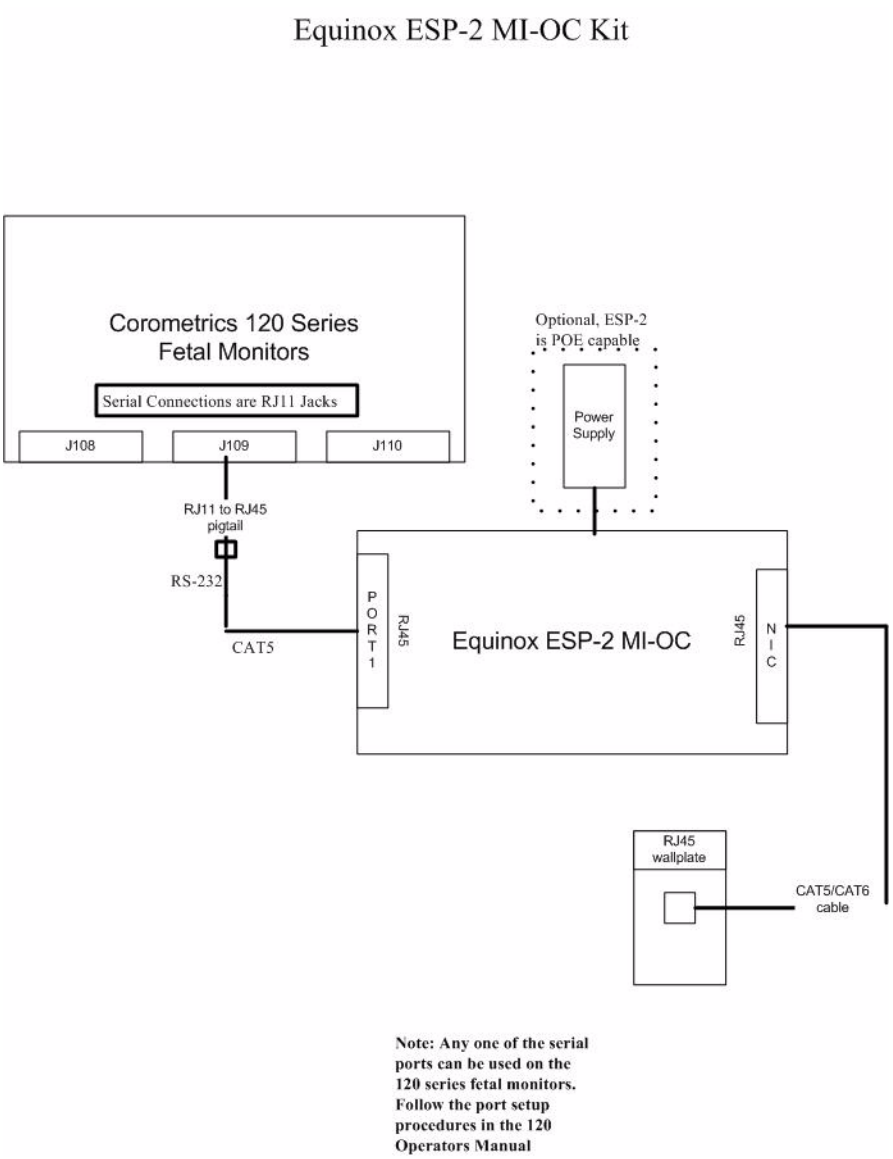


Figure 3-18: Monitor to Wall Plate

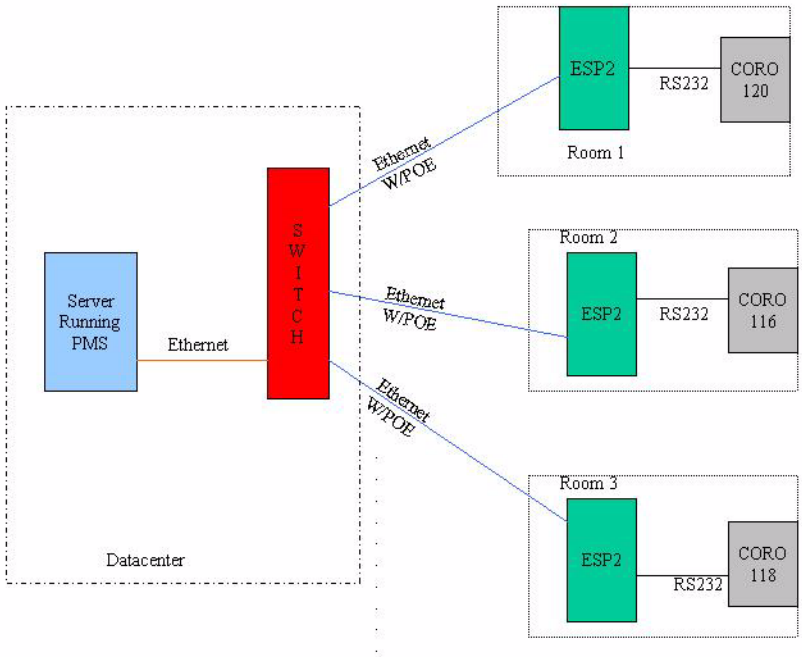


Figure 3-19: Monitor to Switch Diagram

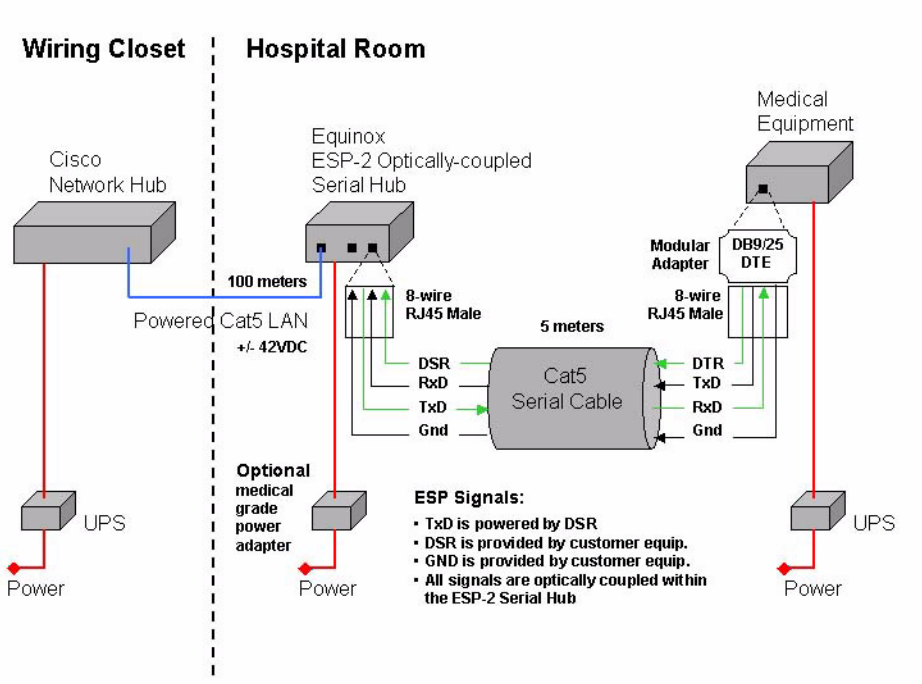


Figure 3-20: Two Port ESP OC

Digi Equipment

The QS system’s PMS process collects data from fetal monitors via serial input. The Digi C/X system provides multiple serial ports on the PC where the PMS process resides. As many as 128 serial connections (and thus fetal monitors) can be multiplexed to a single Digi adapter. This is accomplished by connecting Digi concentrators (also called extenders), each with sixteen serial ports, to the Digi adapter. The Digi adapter's two ports will support a total of up to eight Digi extenders. These extenders can all be daisy chained to one port, or split in any amounts between the two ports. Figure 3-21: Wall Plate to Patch Panel 568B Shielded (Digi) on page 76 shows possible Digi connections.

Two types of media may be used in the Digi serial network: fiber optic and copper cable. Over copper, the fetal monitor passes data via EIA-232 asynchronous serial communication to the Digi concentrator. Thus only copper cable is used to wire rooms to concentrators. Also over copper, the concentrators connect to one another and to the Digi adapter card by way of high-speed EIA-422 synchronous serial connections. However, any number of fiber segments may be inserted anywhere within any of these copper EIA-422 connections when enclosed by a pair of fiber transceivers.

Thus copper and fiber may be used to wire concentrators to each other and to the Digi adapter. Because any single fiber segment can be up to 1.2 miles long, its use will allow the serial connections to span much longer distances than will the 1000-foot cumulative span of the copper cable supporting EIA 422.

NOTE: CAT6 unshielded twisted pair (UTP) cable may not be used for the serial fetal monitoring network. The serial concentrator vendor has specified a cable type and GE must adhere to this specification due to ISO 9001 guidelines and FDA policy.

The following figure describes the connection for the DIGI hardware.

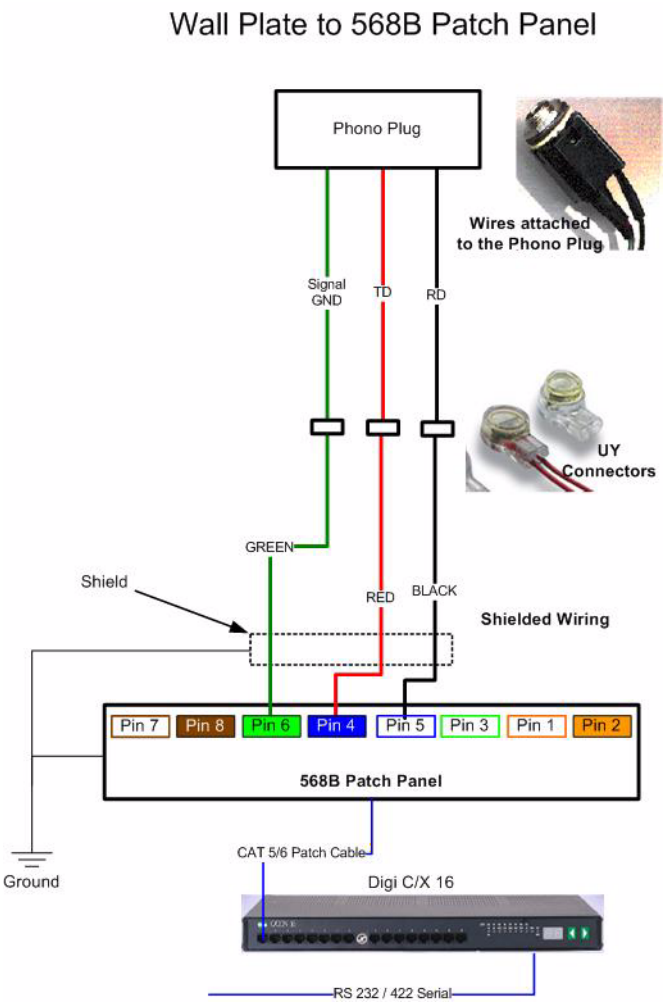


Figure 3-21: Wall Plate to Patch Panel 568B Shielded (Digi)

QS Traffic

The following sections describe the average traffic that is generated by the QS system over the network. Due to the dynamic nature of software applications, this information is subject to change without notice.

What do you want to learn about?

Broadcast Traffic (page 77)

Network Bandwidth (page 77)

Network Latency (page 78)

QS Item Size (page 78)

Broadcast Traffic

All QS applications generate IP broadcast traffic, but the volume is miniscule except for the PMS application when processing fetal monitor data. Each fetal monitor generates 42 bytes per second of data from the serial port. This data is captured and buffered in the PMS application, which stores the data in the QS Server, and also broadcasts the data on the Ethernet according to the network mask (i.e. 255.255.255.0 = 192.168.32.xxx). Data from active fetal monitors is grouped into a single broadcast message and sent out every two seconds. You should assume a 10% overhead of data for TCP/IP packetization of the raw data.

For an example: 10 fetal monitors * 42 bytes per second * 10% overhead = 462 bytes every second or 924 bytes every two seconds being broadcast to the workstations in the subnet. Adding 10% overhead brings the total to approximately 1016 bytes every two seconds. More active fetal monitors would generate more data.

Broadcast traffic can be relayed (tunneled) and re-broadcast in a separate TCP/IP network domain by the QS BRelay (broadcast relay) application. This is required for large hospitals or remote clinics that have multiple broadcast domains. The type of broadcast traffic can be configured to exclude fetal data if you do not need to see live fetal traces from monitors in a separate network but require access to other patient data or stored fetal strips.

Network Bandwidth

Generally the QS system uses on average less than 5% of a standard 100-Base-T network (depending on the number of workstations and users). Some activities can require more bandwidth. For example, large print jobs or batch procedures that cause patients to load into the PDATS cache, new software release/installation, and so forth. All QS applications will download a portion of the configuration tables from the server upon startup/initialization. Applications like Designer and QPM can exceed 5 MB of information during initialization. The purpose of this clinical configuration (CDATS) cache is to maximize performance for the clinical user. This cache

can also be updated dynamically, during manual or automated QPM user logon, if any changes are made to the clinical configuration tables via Designer.

Network Latency

The QS system depends on an efficient network for communications. The QS was not designed to run over the Internet or to operate on overloaded intranet systems. The applications are tolerant of minor latency issues, but can fail if reliable communications cannot be restored quickly. One critical component of the QS system is the Equinox serial concentrator. This device gathers the RS-232 data from the fetal monitors and passes it to the QS server running the PMS application. The Equinox system sends data in 20ms messages to the server. If these packets cannot get to the server within 20 milliseconds, data may be lost. Ping and Tracert are useful tools to determine network latency. Duplex mismatch between devices seems to be the most common cause of latency and performance problems.

QS Item Size

The average size of an item stored in the QS system (not including fetal data) is 55 bytes. Fetal data is stored at a rate of about 2 KB per minute per fetal monitor.

The following table provides IP traffic estimates.

Table 7: Estimated IP Traffic

	# Items	**Bytes/ Item**	**Total Bytes**	**Total Kb**	**Total MB**		
Average Items per stay:	400	55	22000	21.48	0.02		
	# Items	**Bytes/ Item**	**Total Bytes**	**Kb/hr**	**MB/Hour**	**MB/Day**	**MB/Stay**
Average Items updated every 15 minutes per patient: 3.5 average days per stay	40	55	2200	8.59	0.01	0.20	0.70
	Bytes/ Second	**Bytes/ Minute**	**Bytes/ Hour**	**Kb/ Hour**	**MB/Hour**	**MB/8hrs**	
Average fetal data per patient per hour: 8 hour average time on fetal monitor per birth	42	2520	151200	147.66	0.14	1.15	
Total average data per patient per birth in MBytes:	1.88						

Local Area Network

The 10 megabit networks of just five years ago primarily used network hubs, rather than switches, to connect the workstations, printers and other devices to the rest of the network. Hubs lack the ability that network switches have in that they send all incoming traffic out all active ports, while switches use the hardware address (MAC) of each connected device to manage traffic and transmit only to the port to which that address is connected.

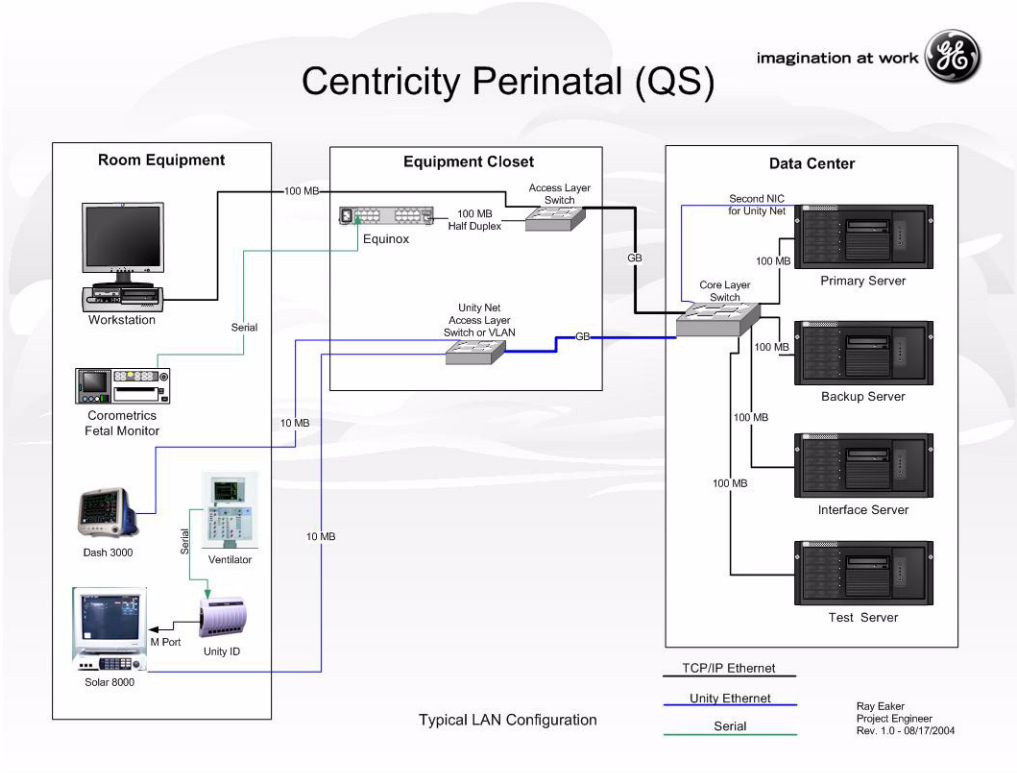


Figure 3-22: Typical LAN Configuration

Hubs and switches are used to connect the various network cables together. Hubs listen on all ports and repeat any data that arrive on a given port as output on all other ports. Switches do the same except that they repeat the incoming data as output ONLY on the proper destination port, as shown in Figure C-3-22. Thus switches allow more network traffic because their intelligent delivery of data confines much traffic to smaller segments, minimizing collisions. Much of the data heard by the switch will not be repeated at all because it will be sent out only from the same port where the destination machine is connected.

Wide-Area Network

The previous topics are applicable to the QS network being installed in a single site. There are additional considerations when implementing a QS network at several, physically separate sites. These instances are referred to as wide area network (WAN) implementations. Redundant links are recommended to avoid a site wide outage should the WAN link go down.

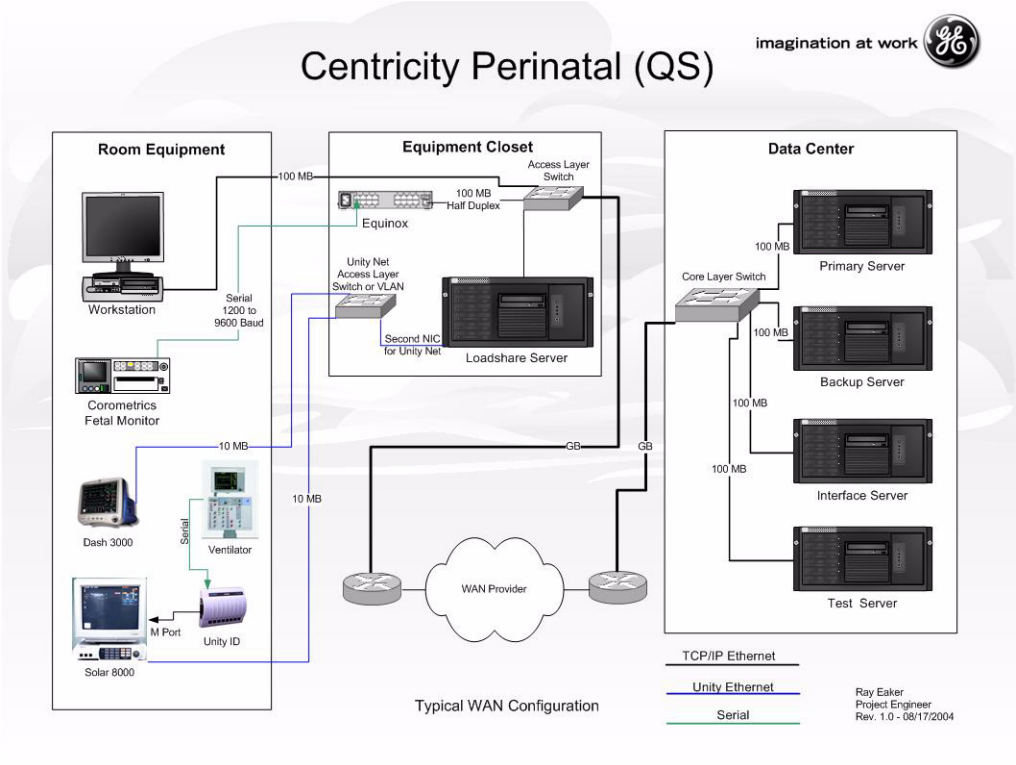


Figure 3-23: Typical WAN Configuration

A WAN is generally considered to be a network that covers a wide geographical area and operates at speeds generally lower than those of a local area network (LAN). The QS has been successfully implemented over a number of connection types, including ISDN, T1, T3, ATM, and so forth. GE has no preference with regard to WAN connection type, but we do have some general guidelines concerning number of workstations per connection type.

- ISDN can be used for single workstation connectivity and performance may be slow.
- T1 may be used for 5 to 10 workstations, depending on how the system will be used at the remote location.
- Remote sites with greater than 10 workstations or that will be using the full functionality of the system (charting, monitoring, chalkboard, and so forth) should be connected using T3 or some other high-speed WAN connection.

The factors that determined these general rules are discussed further in the “Network Recommendations” on page 81. With any WAN implementation, the customer is responsible for installation, configuration and support of WAN components ensuring end-to-end connectivity.

WAN installations typically do not use VLAN technology due to the traffic overhead required on the network to communicate the network configuration within the network. As well, different manufactures have implemented slight variations to the VLAN trunking protocol (VTP), which causes them to not work well with devices from other manufacturers. Also, due to overhead and convergence issues (the time it takes to communicate network topology changes among all devices), VLAN technology is being implemented less and less by hospital IT departments.

Network Recommendations

The following assumes the use of 100Base-T switches and NICs. “Server” means any server class machine (primary server, loadshare server, and so on). Gigabit speeds can be used on servers if desired.

Server

- NIC: Speed = 100/Duplex = Full
- Switch Port: Speed = 100/Duplex = Full, PortFast enabled, PAgP mode off, Trunking off

Equinox (100Base-T)

- LAN Port: Auto-Negotiate (not configurable)

NOTE: The Equinox box will default to Speed = 100/Duplex = Half if connected to a 100Base-T switch port that is not configured to auto-negotiate.

- Switch Port: Speed = 100/Duplex = Half, PortFast enabled, PAgP mode off, Trunking off

Equinox (10Base-T)

- LAN Port: Auto-Negotiate (not configurable)
- Equinox Switch Port: Speed = Auto/Duplex = Auto, PortFast enabled, PAgP mode off, Trunking off

Workstation

- NIC: Speed = Auto/Duplex = Auto
- Switch Port: Speed = Auto/Duplex = Auto, PAgP mode off, Trunking off

The key to proper communication is to ensure that link partner settings match (the 100Base-T Equinox box is an exception to this rule). For example, a switch port set to 100/full duplex connecting to a server set to Auto-Negotiate will not be able to communicate correctly. The switch port, in this case will log errors while communication, though functional, will be crippled. Switch port and NIC settings must match. Devices connected to ports on an unmanaged switch must always be set to Auto-Negotiate.

For more information on PortFast, EtherChannel (PagP) and Trunking, see http://www.cisco.com/warp/public/473/12.html.

Network Configuration: Information and Guidelines

The LAN environment is the most common type of installation for the QS system while WAN installations are becoming more prevalent. Key things for consideration that will help the QS implementation to be most successful include proper configuration of the network and time synchronization.

What do you want to learn about?

Time synchronization (page 82)

Network Device Configuration (page 83)

When to Use Ethernet 10/100Mb Auto-Negotiation (page 83)

Why Do Auto-Negotiation and Compatibility Issues Exist? (page 84)

General Troubleshooting for 10/100 Mbps NICs (page 84)

Why Can't the Speed and Duplex Be Hard-Coded On Only One Link Partner? (page 85)

NIC Compatibility and Operational Issues (page 86)

Yellow Bars on the QS Fetal Display (page 91)

Time synchronization

The QS requires all workstations to be synchronized with the time on the QS server. The system is designed to use the Microsoft TimeServ service to maintain accurate synchronization.

With the introduction of QS 6.60.0, a script is run on each workstation that generates the TimeServ.ini file based on the environment variable “QSUPDATE” on the workstation. The QSUPDATE variable must be set to the name of the primary QS server. The information in TimeServ.ini is used to update the registry with the appropriate information for correct time synchronization. If a site wants to use another time synchronization method, the TimeServ service should be reconfigured or disabled on all workstations to avoid the possible use of multiple time sources. It is recommended that the primary time source, be it the

QS server or another server, be configured to synchronize with a known reliable time source such as the naval observatory.

Network Device Configuration

Each site has unique policies regarding network settings. Some prefer to use 'Auto-Negotiation' while others prefer to 'hard code' each device and switch port to a particular setting. Below is an excerpt from a technical support article found on Cisco's Web site that clearly explains the subject. In our experience, hard coding speed and duplex on connecting devices provides the best performance with the fewest problems, if the devices are capable of being set.

The following information has been copied from Cisco's Web site and has been modified slightly for clarity.

Source: Cisco

http://cco-rtp-1.cisco.com/en/US/products/hw/switches/ps700/products_tech_note09186a00800a7af0.shtml#why_do_auto

When to Use Ethernet 10/100Mb Auto-Negotiation

Auto-negotiation is an optional function of the IEEE 802.3u Fast Ethernet standard that enables devices to automatically exchange information over a link about speed and duplex abilities.

Auto-negotiation is targeted at ports allocated to areas where transient users or devices connect to a network. For example, many companies provide shared offices or cubes for Account Managers and System Engineers to use when they are in the office rather than on the road. Each office or cube will have an Ethernet port permanently connected to the office's network. Because it may not be possible to ensure that every user has either a 10Mb, a 100Mb Ethernet, or a 10/100Mb card in their laptop, the switch ports that handle these connections must be able to negotiate their speed and duplex mode. The alternative would be to provide both a 10Mb and a 100Mb port in each office or cube and label each port accordingly.

One of the most common causes of performance issues on 10/100Mb Ethernet links is when one port on the link is operating at half-duplex while the other port is operating at full duplex. This occasionally happens when one or both ports on a link are reset and the auto-negotiation process does not result in both link partners having the same configuration. It also happens when users reconfigure one side of a link and forget to reconfigure the other side. Both sides of a link should have auto-negotiation on, or both sides should have it off. Hard coding the speed on a port disables all auto-negotiation functionality on the port for speed and duplex.

Why Do Auto-Negotiation and Compatibility Issues Exist?

Auto-negotiation issues may result from non-conforming implementation, hardware in-capabilities, or software defects. When NICs or vendor switches do not conform exactly to the IEEE specification 802.3u, problems may result. Hardware incompatibility and other issues may also exist as a result of vendor-specific advanced features, such as auto-polarity or cabling integrity, that are not described in IEEE 802.3u specification for 10/100 Mbps auto-negotiation. Generally, if both the NIC and the switch adhere to the IEEE 802.3u auto-negotiation specifications and all additional features are disabled, auto-negotiation should properly negotiate speed and duplex and no operational issues should exist.

General Troubleshooting for 10/100 Mbps NICs

Speed determination issues may result in no connectivity. However, issues with auto-negotiation of duplex will generally not result in link establishment issues. Instead, auto-negotiation issues mainly result in performance-related issues. The most common problems when investigating NIC issues deal with speed and duplex configuration. The table below summarizes all possible settings of speed and duplex for FastEthernet NICs and Switch Ports.

NOTE: This section is only applicable for 10/100 Mbps NICs, and not 1000BaseX NICs.

Table 8: Auto-Negotiation Valid Configuration Table

Configuration NIC (Speed/Duplex)	Configuration Switch (Speed/ Duplex)	Resulting NIC Speed/Duplex	Resulting Catalyst Speed/Duplex	Comments
AUTO	AUTO	100 Mbps, Full-duplex	100 Mbps, Full-duplex	Assuming maximum capability of Catalyst Switch and NIC is 100 full-duplex
100 Mbps, Full-duplex	AUTO	100 Mbps, Full-duplex	100 Mbps, Half-duplex	Duplex Mismatch[a]
AUTO	100 Mbps, Full-duplex	100 Mbps, Half-duplex	100 Mbps, Full-duplex	Duplex Mismatch[b]
100 Mbps, Full-duplex	100 Mbps, Full-duplex	100 Mbps, Full-duplex	100 Mbps, Full-duplex	Correct Manual Configuration.
100 Mbps, Half-duplex	AUTO	100 Mbps, Half-duplex	100 Mbps, Half-duplex	Link is established, but switch does not see any auto-negotiation information from NIC and defaults to half-duplex.

Table 8: Auto-Negotiation Valid Configuration Table (Continued)

Configuration NIC (Speed/Duplex)	Configuration Switch (Speed/ Duplex)	Resulting NIC Speed/Duplex	Resulting Catalyst Speed/Duplex	Comments
10 Mbps, Half-duplex	AUTO	10 Mbps, Half-duplex	10 Mbps, Half-duplex	Link is established, but switch will not see FLP and will default to 10 Mbps half-duplex.
10 Mbps, Half-duplex	100 Mbps, Half-duplex	No Link	No Link	Neither side will establish link due to speed mismatch.
AUTO	100 Mbps, Half-duplex	10 Mbps, Half-duplex	10 Mbps, Half-duplex	Link is established, but NIC will not see FLP and default to 10 Mbps half-duplex.

a. A duplex mismatch will result in performance issues, intermittent connectivity, and possible loss of communication. When troubleshooting NIC issues, verify that the NIC and switch are using a valid configuration.

b. A duplex mismatch will result in performance issues, intermittent connectivity, and possible loss of communication. When troubleshooting NIC issues, verify that the NIC and switch are using a valid configuration.

Why Can't the Speed and Duplex Be Hard-Coded On Only One Link Partner?

As indicated in the Auto-Negotiation Valid Configuration Table, manually setting the speed and duplex for full duplex on one link partner will result in a duplex mismatch. This is the result of disabling auto-negotiation on one link partner and the other link partner defaulting to a half-duplex configuration. A duplex mismatch will result in slow performance, intermittent connectivity, data link errors, and other issues. If the intent is not to use auto-negotiation, both link partners must be configured for speed and duplex manually for full-duplex settings.

Recommended Port Configuration (Auto-Negotiation or Manual Configuration)

There are many opinions on the subject of auto-negotiation. Previously, many engineers were advising customers not to use auto-negotiation with any switch-connected device due to the many inconsistencies with how each vendor implemented the standard. However, improvements in the interoperation of auto-negotiation and the maturity of the technology have recently changed the view of using auto-negotiation. In addition, performance issues due to duplex mismatches as a result of manually setting speed and duplex on only one link partner have become more common. Due to these recent issues, using auto-negotiation is regarded as a valid practice.

Understanding Data Link Errors

Many performance issues with NICs can be related to data link errors. Excessive errors usually indicate a problem. When operating at half-duplex setting, some data link errors such as Frame Check Sequence (FCS), alignment, runts, and collisions are normal. Generally, a one percent ratio of errors to total traffic is acceptable for half-duplex connections. If the ratio of errors to input packets is greater than two or three percent, performance degradation may be noticed.

In half-duplex environments, it is possible for both the switch and the connected device to sense the wire and transmit at exactly the same time and result in a collision. Collisions can cause runts, FCS, and alignment errors due to the frame not being completely copied to the wire, which results in fragmented frames.

When operating at full duplex, FCS, Cyclic Redundancy Checks (CRC), alignment errors, and runt counters should be minimal. If the link is operating at full duplex, the collision counter is not active. If the FCS, CRC, alignment, or runt counters are incrementing, check for a duplex mismatch. Duplex mismatch is a situation where the switch is operating at full duplex and the connected device is operating at half-duplex, or vice versa. The result of a duplex mismatch will be extremely slow performance, intermittent connectivity, and loss of connection. Other possible causes of data link errors at full duplex are bad cables, faulty switch port, or NIC software/hardware issues.

NIC Compatibility and Operational Issues

Use the following table as guide to troubleshooting NIC issues. Please consult the NIC vendor for verification and proper resolution of issue.

Table 9: NIC Troubleshooting

NIC Model/ Manufacture	Symptom	Description	Resolution
3COM 3C574/575 PCMCIA 10/100	Extremely slow performance when operating at 10 MB.	The 3C574/3C575 experiences slow performance when connecting at 10 MB with Catalyst 2948G, 2980G, 4000, 5000, and 6000s switches. This issue is due to the NIC doing auto-polarity upon linkup.	Upgrade to latest NIC card driver and disable auto-polarity.
3COM 3C595	FCS and/or alignment errors recorded on switch. Noted slower performance. When using the 3C595 adapter in 100 MB half-duplex. This problem only usually represents 1% - 2% of the total traffic.	FCS and/or alignment errors when using the 3C595 adapter in 100 MB half-duplex. This problem usually represents 1% - 2% of the total traffic.	Upgrade to the latest NIC driver and disable Bus Master. These steps will reduce FCS and alignment errors.

Table 9: NIC Troubleshooting (Continued)

NIC Model/ Manufacture	Symptom	Description	Resolution
3COM 3C905/ 3C905B	Intermittent DHCP Issues.	Despite configuring Catalyst switch ports correctly, workstations still experience some intermittent DHCP issues.	Upgrade to driver version 4.01b or higher which resolves DHCP issues.
3COM 3C905/ 3C905B	Unable to logon to Novell IPX Network.	Despite configuring Catalyst switch ports correctly, workstations still experience intermittent Novell IPX logon issues.	Upgrade to driver 4.01b or higher, which resolves IPX auto-frame type issues. Alternatively, manually configure workstations for IPX frame type.
3COM 3C905B	Slow performance when receiving large files.	Notable slow performance when receiving large files. Problem only occurs with standard Microsoft NT 4.0, regardless of service pack.	Download latest driver from 3COM tech support.
3COM 3C905C	L2 errors reported on switch port (FCS, alignment, CRC, and runts), and slow performance on high speed workstations.	Under normal operating conditions, a Catalyst which will report numerous L2 (physical) errors on ports connected to 3C905C NIC adapters.	Load latest driver and diagnostic tools available from 3COM. Test performance back-to-back between two PCs, and note errors on diagnostic tools. Errors reported such as transmit underrun and receive overrun will result in physical layers being reported by switch and minor performance issues. See Bug ID CSCdt68700 for more details.
3COM 3C980	Data corruption using Novell	N/A	See 3COM tech support reference 1.0.33921641.2241835.
3COM	3C985/3C985B	Novell 5.0 Issues	See 3COM tech support reference 1.0.16744826.2027011.
3COM 3C985/ 3C985B	Clients unable to log on or browse server, but pings work correctly.	N/A	See 3COM tech support reference 2.0.4428387.2305072.
3COM 3C985/ 3C985B	Packets larger than Ethernet MTU (1518 bytes) are generated. These packets are noted as giants on Catalyst switches.	N/A	Contact 3COM tech support.

Table 9: NIC Troubleshooting (Continued)

NIC Model/ Manufacture	Symptom	Description	Resolution
3COM 3C905C or 3C920 integrated NIC on Dell Dimension XPS	Network connectivity is dropped every two to three minutes and/or network card must be re-initialized several times to gain network connectivity.	A 3C905C or 3C920 integrated NIC on Dell Dimension XPS may experience network connectivity issues when running Microsoft Windows 2000 or 2003 due to a power management issue.	Disable all power management functions. Contact Dell for details on disabling power management or more details surrounding this issue. For more documentation, see 3COM tech support reference: 2.0.47464140.2853794
Compaq Netflex-3 Model NIC Adapters	Slow performance	Auto-negotiation may fail to Cisco Catalyst 5000/5500 Switches.	This problem is resolved in software release 4.5(1) and later for the Catalyst 5000/5500 Switches. (CSCdk87853)
Dell Precision 420/ 530/620	When connecting to the Catalyst 2950 with an Auto-negotiation link, it continuously flaps and the w/o Auto-negotiation link fails. The motherboards where spun with Intel Chipset that are incompatible with Cisco Switches and Netgear Hubs.	Manufactured between 5/21/01 and 8/01/01	Contact Dell Tech Support and Cisco TAC for more details.
IBM 10/100 EtherJet CardBus Adapter	Extremely slow performance when operating at 10 Mbps.	Certain 10/100 switches implement automatic correction for polarity reversed cables that are not completely compatible with the same correction provided by the IBM 10/100 EtherJet CardBus Adapter. If the network speed is forced to 10Mbps, severe throughput problems may be experienced.	To resolve this problem, a new Auto Polarity keyword in the adapter's advanced properties has been added. If needed, the default setting of ON (meaning that the card will compensate for reversed cables) can be set to OFF to disable polarity correction. This will restore normal throughput.
IBM ThinClient Workstations	Link flaps continuously after extended operation.	Workstations prior to Service Pack 3.0 will bounce link on switch after continuous use when attached to Catalyst 2948G/4000 switches on software version 6.x and later.	Upgrade IBM ThinClient to Service Pack 3.0.

Table 9: NIC Troubleshooting (Continued)

NIC Model/ Manufacture	Symptom	Description	Resolution
Intel Pro/100	Consistent Link Up/Down Connections to Catalyst Switches	May be caused by Power Management. Contact Intel tech support for further information.	Go to Control panel / System /Hardware /Device Manager. Click the Network Adapters / Intel Pro 100 +. At the Power Management tab, Unmark the “Allow the computer to turn off this device” tab.
Intel Pro/1000 T gigabit Copper NIC	When an Intel Pro/1000 T NIC is connected to a Catalyst switch, the customer may see poor network connections or excessive numbers of dropped packets. The interoperability issue arises when a module with a TBI interface transmits an odd byte packet to a receiver with a Gigabit Media Independent Interface (GMII).	The interoperability issue arises from the implementation of Carrier Extension. Carrier Extension is detailed in sub section 35.2.3.5 in the IEEE 802.3 specification. Carrier Extension can be used to pad the last byte of a packet, so the packet is aligned on an even numbered boundary.	Contact Intel Tech Support for the latest driver.
SUN Microsystems QFE Card	Unable to manually set speed and duplex correctly.	Manually setting speed and duplex only effects the first of four ports only.	Contact vendor tech support to obtain latest driver to resolve issue.
SUN Microsystems v1.1 gigabit Cards	Unable to establish link.	V1.1 may not establish link to switch.	Contact vendor tech support or V2.0 gigabit Card.
XIRCOM CreditCard Ethernet 10/100 CE3B-100	Not negotiating or operating correctly at 100 Mbps full-duplex.	Full-duplex operation is only supported at 10 Mbps. Full-duplex is not supported at 100 Mbps. The LineMode keyword has no effect on performance at 100 Mbps. If the LineSpeed keyword is set to 10 0Mpbs and the LineMode keyword is set to full-duplex, the LineMode keyword will be ignored. Full-duplex at 10Mbps is only available when the adapter is connected to a full-duplex capable switch or hub.	Do not operate this NIC card at 100 Mbps full-duplex.

Table 9: NIC Troubleshooting (Continued)

NIC Model/ Manufacture	Symptom	Description	Resolution
XIRCOM CreditCard Ethernet 10/100 CE3B-100	Not negotiating 10 Mbps full-duplex.	The CE3 and in some cases the CE3B are not capable of negotiating to 10 Mbps full-duplex mode.	On these adapters, in order to operate in full-duplex mode, the LineSpeed keyword must be set to 10 Mbps and the LineMode keyword must be set to full-duplex. The cable type keyword can be set to Auto Detect or 10BT/100BTX. The corresponding port on the attached hub or switch should also be set to 10Mbps full-duplex.
XIRCOM RealPort2 CardBus Ethernet 10/100 Adapter (R2BE/RBE/CBE) Models	Extremely slow performance when operating at 10 Mbps.	Certain 10/100 switches implement automatic correction for polarity reversed cables that are not completely compatible with the same correction provided by the CBE/RBE. If the network speed is forced to 10 Mbps, severe throughput problems may be experienced.	To resolve this problem, a new Auto Polarity keyword in the adapter's advanced properties has been added in driver version 3.01.If needed, the default setting of ON (meaning that the card will compensate for reversed cables) can be set to OFF to disable polarity correction. This will restore normal throughput.
XIRCOM RealPort2 CardBus Ethernet 10/100 Adapter (R2BE/RBE/CBE) Models	Initial Network Connections may fail. DHCP may obtain IP address and Microsoft Windows NT logon and Novell IPX may fail.	Initialization delay. Certain switches and routers are unable to immediately forward network traffic when a network adapter first establishes link to one of its ports due to initialization delays. This problem is most commonly seen when the network adapter is connected directly to ports on the switch. The adapter by default (when used under some operating systems) will have almost no delay between link and the initial network request.	A new keyword, Initialization Delay, has been added to the adapter's advanced properties which will prevent forwarding of network requests for a user-selectable period of time. Delays can be added ranging from one to sixty seconds. In most cases adding a delay in the one to three second range will be sufficient to resolve the problem.

Table 9: NIC Troubleshooting (Continued)

NIC Model/ Manufacture	Symptom	Description	Resolution
XIRCOM RealPort2 CardBus Ethernet 10/100 Adapter (R2BE/RBE/CBE) Models	Not able to connect to network or get an IP address from DHCP Server when connected to port replicator or docking station.	Contact vendor tech support.	If you are attempting to use a CBE/CBE2/RBE in a port replicator or docking station, using Microsoft Windows 95 and are having problems, and then confirm that your laptop has the latest BIOS and that the latest manufacturer's patches and utility software have been installed.
Xircom XE2000 PCMCIA NIC	Will not auto-negotiation to 100 Mbps, full-duplex.	NIC will only auto-negotiate to 100 Mbps, half-duplex.	Known limitation of XE2000 NIC, see XE2000 release notes.

Yellow Bars on the QS Fetal Display

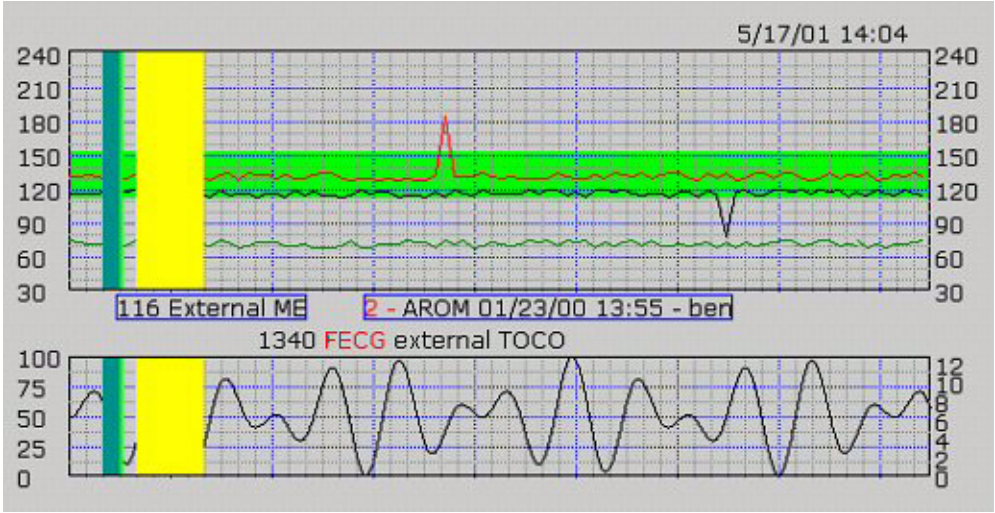


Figure 3-24: Example of a Yellow Bar

What is a Yellow bar?

- A yellow bar is an indication of data interruption on the QS Surveillance display.
- It indicates that we expected more data from the fetal monitor than was actually received
- The missing data may be only a temporary display anomaly, or it could be actual data loss recorded in the patient file. In the former case, refreshing the surveillance display manually can eliminate the yellow bar.

Why is it yellow?

- The color is configured in the QS database Designer on the System Tab, under Surveillance, FMS Colors, Data Interruption. The default value is yellow.
- The engineers wanted to make an obvious contrasting color to indicate the possibility of data interruption.

When are they displayed?

- When the QPM program is scrolling fetal data across the screen, it expects to receive a broadcast message from the PMS program every 2 seconds. Each of these broadcast packets has a sequence number. If the received packet sequence number is higher than expected, then we assume that data has been lost. A "Yellow Bar" is displayed on the screen with a width equal to the amount of lost data. In the example above the yellow bar looks to be about 30 seconds long in an 8-minute display.
- The PMS program expects to receive a continuous stream of data from every fetal monitor. This data is collected and measured through time. If we do not receive data for 60 seconds or more we assume the monitor has been turned off. If we stop receiving data for less than 60 seconds and then receive data again, we assume there was a delay in the data stream. Periodically we measure the amount of data received vs. the amount of time elapsed. If we do not have as much data as we expected, then a yellow bar is inserted proportional to the amount data missing. This is stored in the patient record and broadcast to any screen displaying this patient record.

What are the known causes?

NOTE: Note that any kind of network communication is subject to spurious data loss (especially serial more so than ethernet). Data loss can be compensated for with a protocol that detects lost data and provides retransmission of lost bytes. TCP/IP is a good example of a good protocol. Unfortunately, the fetal monitor protocols do not support data loss detection and retransmission.

The following is a partial list of things that can cause "Yellow Bars". These are not in any particular order.

- **Test Mode**: Pressing the "Test" button on the Corometrics 115, 116 and 118 monitor will stop sending data out the serial port.
- **Clock drift**: The computer clock and the fetal monitor clock may not be well synchronized. If time is running faster on the computer than the fetal monitor we will always expect more data than the monitor can deliver.
- **Nursing practices**: Sometimes the staff will turn a monitor off and on again, or disconnect and reconnect the data cable within a 60 second window.
- **Server CPU Load**: If the QS Server does not have enough CPU or RAM resources, the PMS program may not be able to receive all fetal data.

- **Wiring**: The fetal monitor (or SADC converter) is sending data via RS-232 signals over various distances and in unknown environmental conditions. Although we provide high quality RS-232 cabling and request no length be greater than 250 feet, some customers have not adhered to these standards. Also, wallplates and connection points can be pulled or damaged.
- **Ethernet Network**: In many installations we have used an Equinox serial concentrator that converts the RS-232 data into ethernet traffic. This reduces the amount of special cabling required, but then promotes the network to a 'mission critical' status. In some cases this network is customer supplied is not fast enough to handle the data.

What are the known fixes?

- The following is a list of things that have helped reduce "Yellow Bars". These are not in any particular order.
- **QS Update**: Some QS timing tolerances were expanded in QS 5.05 P05 and in QS 5.05.3 (plus all later releases). These tolerances will allow more time for the 'delayed' fetal data problem. It also can compensate for some clock synchronization problems.
- **Equinox Firmware**: Equinox found a bug in their software that could have been triggered at sites with a Backup server. The ESP-16 2.06A firmware (or later) can be installed by QS Technical Support.
- **Network upgrade**: Some customers have updated the shared media network hub to a high-speed ethernet switch. This can help network throughput.
- **Cables**: Replacing a wallplate or re-punching the cables in the wiring closet can improve signal quality on known bad lines.
- **Digi**: Some customers have chosen the Digi concentrator instead of the Equinox system to eliminate the Ethernet component altogether.
- **Server Resources**: Some sites have added a "Load Share" server dedicated to the PMS program to guarantee server resources are always available.

Vendor Access to the QS System

The QS system requires remote connectivity for the GE Technical Support team. QS Software upgrades occur anywhere between two and six times a year, and include major and minor releases and patches. The approved connection methods are: GE InSite II Internet connection, GE site-to-site VPN, or an analog modem. Remote connectivity allows GE to service, troubleshoot, and maintain the system. Modem dial-up connectivity requires a customer provided modem, telephone line and TCP/IP addresses for RAS connection. InSite II or VPN site-to-site connections are preferred, and allow for a faster, more reliable, encrypted communications.

InSite 2.0 allows you to establish connectivity from behind the safety of your corporate firewall, adhering to all security policies set up by your network administrators. All communications via InSite2 are ssl encrypted, logged, and access controlled through GE corporate security. To set up the InSite II Agent at your site, the only networking requirements are as follows:

- A physical connection or a route to an existing enterprise LAN
- Allow outbound Internet access for the device using HTTPS protocol

An InSite II brochure and FAQ sheet are available to describe the connectivity details and security protocols.

NOTE: A GE Healthcare Field Engineer will install a product or software upgrade that incorporates InSite II and configure network connections according to your IT requirements.

GE may use the connection to download new QS software, application files, and/or tool releases to the server. After download to the server, the clients automatically download the new software when the clients restart. The site may contact GE Technical Support to report system problems and open a support call. The assigned support engineer will then use the connection to troubleshoot, diagnose, and/or repair the problem.

While the majority of our customers have the connection active at all times, there have been occasions when, due to security concerns, customers have either implemented security restrictions around use of the connection. For dialup connections, the most common method of introducing additional security is having the modem powered off and requiring the technical support engineer to call a 24-hour hospital help desk for modem activation. For VPN connections the site may require GE to provide usage logs to the hospital network security department on a monthly basis.

Certain hospitals also have special restrictions surrounding after-hours vendor access to the hospital systems. It is important that the GE Technical Support team is aware of the technical specifications of your hospital's QS environment, as well as the security restrictions and non-business hours feasibility.

Interfaces

The QS application is capable of receiving data from HL7 compliant hospital information systems (HIS), Lab, and Pharmacy systems. The QS system accepts HL7 data in XML format from an interface gateway that is loaded on the QS server hosting the interface. This will either be the primary server or a designated loadshare server. At this time, cluster servers are not permitted to host the interface.

There are two ways the connection between systems can be made. The most common interface is a TCP/IP socket based network connection. Basically, a router is placed between the QS network segment and the hospital network, allowing the traffic to be passed to and from (if export is purchased) the QS server. The second connection method, which is rarely used, is a serial connection that runs from the HIS system directly to a COM port on the QS server running the data acquisition process.

Serial Cable Specifications

Cable requirements for commonly employed network configurations are provided in the following paragraphs.

Copper room-to-concentrator

Copper for RS-232, shielded, untwisted cable with foil and drain wire, 22 AWG installed in compliance with local codes. There is a 250 foot distance limitation from fetal monitor to serial concentrator.

Copper concentrator-to-concentrator/concentrator-to-host adapter card

Copper for RS-422, STP 4-pair, foil with drain wire, 24 AWG installed in compliance with local codes. There is a 1000 feet (cumulative) from the host adapter to the last serial concentrator on the line.

Fiber optic concentrator-to-concentrator/concentrator-to-host adapter card

Fiber Optic, Multimode 62.5mm/125mm, duplex configuration. 1.2 miles distance limitation.

NOTE: The 1000’ cumulative distance from the host adapter to the last serial concentrator still pertains when fiber is employed. The length of fiber is merely not considered in the overall measurement,

The most important characteristics of this system that need to be considered during the quote phase are:

- 16 ports (beds) per serial concentrator
- Two separate lines on the Digi controller card (typically installed in the main or load share server)

- Any combination among the two lines of the adapter up to 8 extenders

Physical location will effect the amount of equipment needed and its layout. For example, if there are 4 beds in Unit A and 5 beds in Unit B a site may need two extenders (although there are fewer than 16 beds) due to physical separation of the units and the location of serial cable terminations.

Ethernet Cable Specifications

Cable requirements for commonly employed LAN configurations are provided as follows:

- **Ethernet cabling specifications and limitations**:

  Plenum rated CAT6 unshielded twisted pair (UTP) 4-pair, 24 AWG

  330’ from component to component

- **Fiber specifications and limitations**:

  Multimode 62.5µm/125µm, duplex configuration

  1.2 miles distance limit

IP Communication: Network Traffic

On average, the QS software places a 5-15% load on a local 10Mb Ethernet network. During the running of certain processes such as printing, PtD jobs (patient data export and archiving), chalkboard verification functions, and fetal data review of high risk patients (long-term monitored patients), the network can experience bursts of 40-60%.

A T1 line speed is 1.544 Mbps (about $1/6^{th}$ the speed of Ethernet). When using the QS system across a wide area network, the average bandwidth utilization of the software can exceed the entire capacity of a T1 line**.** Consequently, if a hospital has more than 10 workstations connecting to the server over a WAN, a single T1 line is not sufficient.

Several alternatives are available. If possible, connection via fiber is the most efficient. If a fiber solution is not viable, options include multiple T1 lines (1 line per 10 workstations) and a load balancing router (a router that bonds T1 lines together and switches from one line to the next when the a T1 line reaches capacity), or other high speed networks such as T3, ATM or frame relay.

The figures above are estimates. Recommendations are based on the assumption that the QS system is isolated from the house network and/or is running on a dedicated T1 line(s).

The QS System and the Hospital Network Environment

Because of the amount of broadcast data associated with the patient monitoring functionality of the QS system, and the need for available bandwidth to transmit critical patient information, it is highly recommended that the QS network segment is physically or virtually isolated from any existing hospital “house” network. Segmentation also aids in troubleshooting and problem isolation for both the QS network and the house network. Having the networks isolated eliminates one potential source of error for both GE Technical Support and a hospital’s IT staff.

There are three methods of network isolation most commonly used with QS implementations. Physical segmentation has new, dedicated cable installed for exclusive use of the QS system. This is the most common and easy to implement manner of isolation. A router may be installed to isolate the QS segment from the house network. Finally, in a switched environment, the QS system may be placed on its own VLAN.

Unity Equipment

The GE Unity network is a link for efficient sharing of clinical information between cardiology, patient monitoring (non-fetal or maternal/fetal), hospital information and laboratory equipment.

A second network interface card is installed into the QS machine (and its backup, if one exists) which gathers patient data. This card is assigned an IP address in the Unity network range as supplied by GE. This card is then connected to one of the Unity (real time network) hubs. Information is then made available to the QS system from GE monitors as well as non-GE bedside devices connected to the network. Non-GE devices are connected using Octanet, Octacomm or Unity Network Interface Device solutions.

Interface Devices

The Octacomm and Unity Network ID devices are self-contained, network-able, multi-port data interface devices that have the ability to interface external, standalone, patient-connected devices to the GE Unity network.

Octanet

Essentially, the QS system will interface to the Octanet in the same manner as an Octacomm or Unity Network ID device. The difference is the Octanet interfaces peripheral bedside devices *through* a Solar monitor as compared to the interface devices that are connected to the same network as the adult monitors. When interfacing to Octanet, the QS system will receive what the adult monitor transmits, which is not necessarily all parameters which the peripheral bedside device is transmitting.

The type of bedside peripheral devices include, but are not limited to, ventilators, IV pumps, NBP, SpO2, urimeters, other manufacturer's monitors, or any device that produces RS-232 serial output. Device ID Cable Adapters (DIDCA) are used to interface and identify various devices to the Unity Network ID, Octacomm, and Octanet.

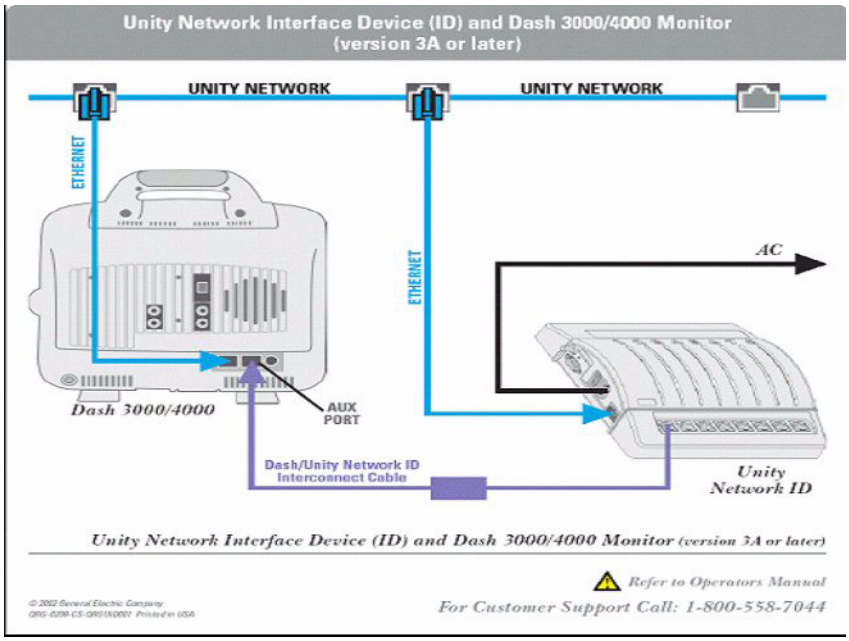


Figure 3-25: Unity to Dash 3000/4000 Monitor Interface

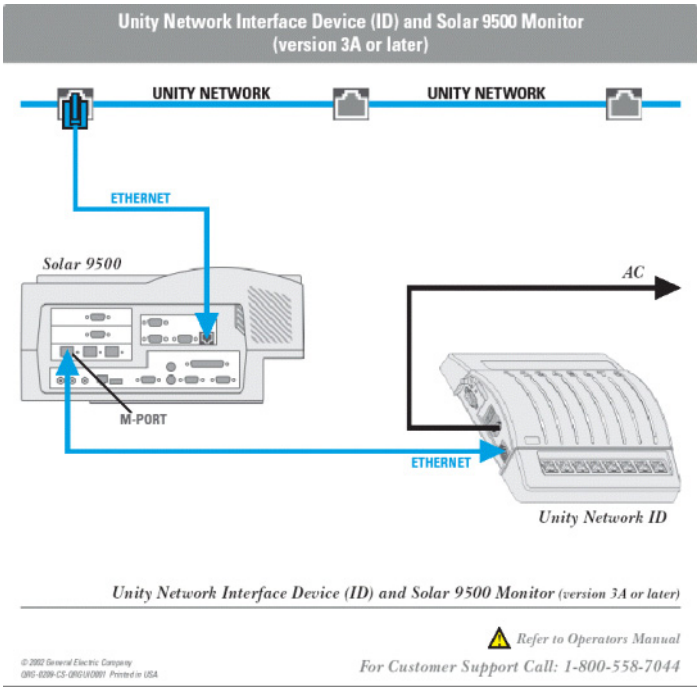


Figure 3-26: Unity to Solar 9500 Monitor Interface

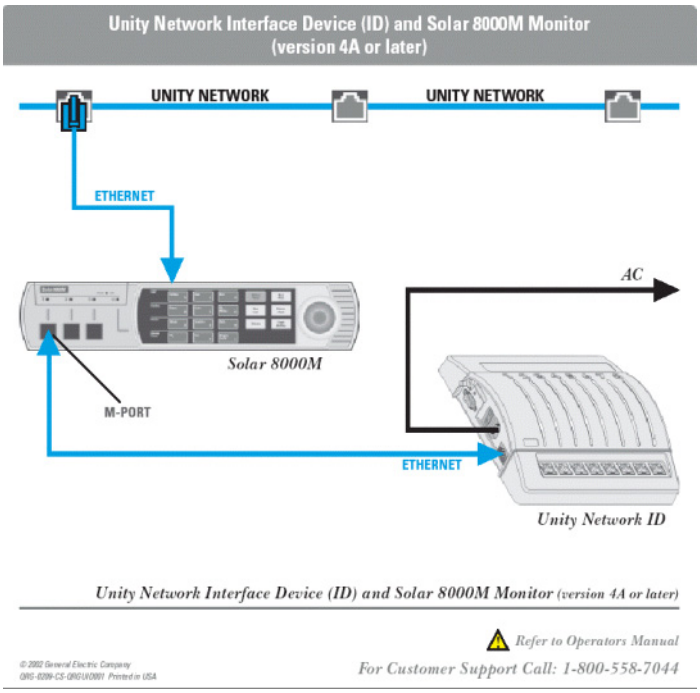


Figure 3-27: Unity to Solar 8000M Monitor Interface

NT Issues

User Accounts and Security

The QS system uses two accounts for system functionality: QS and QSuser. The QS account is a member of the Administrative group on the local machine and is used for support purposes. The QSUser account is a member of the Users group and has no special privileges. By default, the system will automatically log on the QSUser account and start the QS application; this behavior can be disabled.

Workgroup versus Domain

The standard QS system uses the workgroup model. If a site wants to integrate the QS workstations into an existing domain, the site may do so after the system is installed. The site will be responsible for managing the domain and must maintain the Domain Controller/Backup Domain controller on servers other than the QS system servers.

Third Party Applications

Third party applications may be installed on the QS clients. The installation and support of these applications is the sole responsibility of the hospital staff. GE will not provide technical support for installation and/or use of such applications.

Static IP Addresses and DHCP

While the QS system can be implemented in a network that utilizes DHCP, the IP addresses assigned to the QS workstations need to be static. The QS workstations are identified within the application by their IP addresses.

Chapter 4: Software Considerations

Events such as workstation replacement or repair will make it necessary for support personnel to either install or upgrade the QS configuration on one or more client workstations. The following paragraphs describe both of these processes.

This section also lists the minimum requirements for upgrading to QS Version 6.70.5.

Please note that changing server configurations, workstation names, and so forth or other integral parameters of the QS system (as installed at your site) is a serious undertaking. Generally, tasks of this nature should not be attempted without discussion with either a member of your facility's IT staff or a QS Customer Support representative.

What would you like to learn about?

- Software Installation (page 101)
- Software Upgrades (page 112)

Software Installation

The install application contained on the QS® Client CD (part number 2014897-009) provides a quick and efficient method of performing the following QS client workstation configuration tasks:

- Verification of all inputs
- Creation of necessary directory structure
- Placement of tools files into their proper location on the target machine
- Creation of QS accounts—QS, **QSUSER** (if needed)
- Creation of **Start** menu items
- Addition of registry entries to support the QS
- Addition of the Time Service
- Addition of the **WINVNC** server
- Establishment of autologon parameters

Prerequisites

Requirements for QS 6.70.5 client workstations, server workstations and network configurations are provided by Table 10, Table 11, and Table 12, respectively.

NOTE: If your site is using Customer-Supplied Equipment (CSE), refer to the *Customer-Supplied Equipment Guide* (part number 2002033-045) for additional information.

Table 10: Client Workstation Requirements

CATEGORY	REQUIREMENT
General Requirements	• Must be capable of operating with Microsoft Windows NT 4, Microsoft Windows 2000 Professional, Microsoft Windows 2003 Professional, or Microsoft Windows XP. • Must be capable of running Quantitative Sentinel (QS) Version 6.70.5 • Must be capable of operating on a TCP/IP-based network - network requirements are provided in Table 12 • Operating System partition must be 4 GB or greater • Space allocated for QS configuration and data storage must be 4 GB or greater • Video system (monitor) must support a resolution of 1024x 768 dpi and be capable of displaying 256 colors • Taskbar property **Always on Top** must be disabled
Additional Requirements for Perinatal Installations	• Must be capable of emitting audible alert tones • Must not shut down the patient data display (for example, the power-save mode must be capable of being disabled) • Must support use of Internet Explorer Version 6.0 or later • Must support use of Adobe Acrobat Version 4.0 or later
Required Components for NEW Installations	• Intel Pentium Microprocessor operating at 1.0 gigahertz or greater (the Fluid Manager feature, available in EMEA only, requires 1.8 gigahertz or higher) • Microsoft Windows 2003 Professional with Service Pack 1, Microsoft Windows 2000 Professional with Service Pack 3, Microsoft Windows NT 4 with Service Pack 6, or Microsoft Windows XP SP 2. • 256 MB of RAM or greater (the Fluid Manager feature requires 512 MB or higher) • 4.0 GB Storage Subsystem or greater • 17 inch (or greater) Display Monitor with a refresh rate of 72 hertz • Keyboard • Microsoft Windows-compatible Mouse or Trackball • CD-ROM Drive

Table 10: Client Workstation Requirements (Continued)

CATEGORY	REQUIREMENT
Required Components for Sites Upgrading to QS 6.70.5	• Intel Pentium Microprocessor operating at 400 megahertz or greater • Microsoft Windows 2003 Professional with Service Pack 1, Microsoft Windows 2000 Professional with Service Pack 3, Microsoft Windows NT 4 with Service Pack 6, or Microsoft Windows XP SP 2. • 96 MB of RAM or greater • 4.0 GB Storage Subsystem or greater • 17 inch (or greater) Display Monitor with a refresh rate of 60 hertz or greater • Keyboard • Microsoft Windows-compatible Mouse or Trackball • CD-ROM Drive
Additional Considerations	• All hardware should appear on the Microsoft Compatibility List appropriate for the installed operating system.

NOTE: If your site is using Customer-Supplied Equipment (CSE), refer to the *Customer-Supplied Equipment Guide* (part number 2002033-045) for additional information.

Table 11: Server Workstation Requirements

CATEGORY	REQUIREMENT
General Requirements	• Must be capable of operating with Microsoft Windows 2003 Server • Must be capable of running Quantitative Sentinel (QS) Version 6.70.5 • Must be capable of operating on a TCP/IP-based network—network requirements are provided in Table 12 • Operating System partition must be 2 GB or greater • QS configuration and data storage partition must be between 4 GB and 16 terabytes
Required Components for NEW Installations	• Intel Pentium Microprocessor operating at 1.0 GHertz or greater • 768 MBytes of RAM or greater • 18 GB RAID-5 Storage Subsystem or greater with either a hot-spare or backup drive • Microsoft Windows-compatible pointing device (mouse or trackball) • 1024x768 Display Monitor capable of 256 colors or greater • Uninterruptible power supply or battery backup • Keyboard • CD-ROM Drive or a DVD Drive if using the CCG feature. • Clustered-server configuration or warm backup server

CATEGORY	REQUIREMENT
Required Components for Sites Upgrading to QS 6.70.5	• Intel Pentium III (or compatible) Microprocessor operating at 500 MHertz or greater • 384 MBytes of RAM or greater • 9.0 GB SCSI Storage Subsystem (RAID-5 or Monolithic)** • Microsoft Windows-compatible pointing device (mouse or trackball) • 1024x768 Display Monitor capable of 256 colors or greater • Uninterruptible power supply or battery backup • Keyboard • CD-ROM Drive or a DVD Drive if using the CCG feature.
Additional Considerations	• All hardware should appear on the Microsoft Compatibility List appropriate for the installed operating system.

** On NT4 QS Servers with C:; D:; E:; F:; and G: drives, the QS drive (D:) used for configuration information must have a storage capacity of 1 GB or greater.

The QS system requires a functional and reliable network system. Customers are responsible for providing and maintaining the network operation and performance characteristics at an acceptable level (see Table 12).

NOTE: If your site is using Customer-Supplied Equipment (CSE), refer to the *Customer-Supplied Equipment Guide* (part number 2002033-045) for additional information.

Table 12: Network Requirements

CATEGORY	REQUIREMENT
General Requirements	• Must be capable of transmitting and receiving TCP/IP messages between clients and servers • Cable length must conform to network hardware manufacturer's specifications • Wireless transmission distance must conform to network hardware manufacturer's specifications
Hardware Components	• Network components must conform to IEEE-802 standards • Components installed in client and server workstations must be supported by Microsoft - appear in the Hardware Compatibility List available on the Microsoft Web site - **http://www.microsoft.com/hcl**
Workstations	• Client to server communications must ensure TCP/IP communication with low latency times (<10 millisecond average) and sufficient bandwidth (average utilization < 20%) • Server components must be capable of transmitting at 100 Mbps or greater • Client components must be capable of transmitting at 10 Mbps or greater
Network Drawings	• Detailed network drawings (reflecting the as-built configuration) must be made available to GE.
Anti-Virus Protection	• Symantec's Norton AntiVirus Corporate Edition software

Server Workstation

Table 13 summarizes QS Tools applicability to specific QS versions and the specific CDs upon which each version of QS Tools may be found.

Table 13: Tools Version Applicability

CD-ROM	Revision	Tools Version	QS Version	Status
2008342-002	A	1.04	5.06.1	Active
2008342-002	B	1.05	6.00.0	Obsolete
2008342-002	C	1.05	6.00.0	Active
2008342-002	D	6.70.5	6.70.5	Active

Assumptions

The Installqs application assumes that the Primary QS server is named QSSERVER and that it is reachable using TCP/IP. If the server name is not QSSERVER, then the variable QSUPDATE must be changed on every client to the name of the server that has the QS files for downloading. If the client cannot reach the server because it is in another IP domain, then the LMHOSTS and Hosts files must be modified to point to the correct TCP/IP address for the Primary QS Server.

Information on changing environmental variables and modifying the LMHosts and Hosts files may be found in the Microsoft Windows documentation provided by Microsoft.

Installation with the InstallShield

The following steps describe how to install the QS client application using the InstallShield on the Client CD.

1. Place the CD in the drive.

   The InstallShield Wizard's Preparing to Install dialog box is displayed.

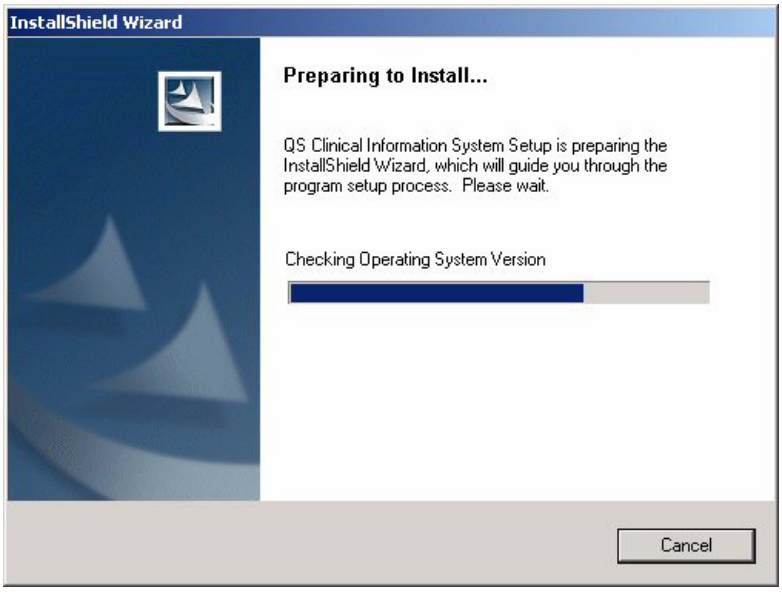

InstallShield Wizard
Preparing to Install...
QS Clinical Information System Setup is preparing the InstallShield Wizard, which will guide you through the program setup process. Please wait.
Checking Operating System Version
Cancel

Figure 4: Preparing to Install Dialog Box

2. Wait while the InstallShield checks the operating system on the workstation.

   The InstallShield's Welcome to the InstallShield Wizard for the QS Clinical Information System dialog box is displayed.

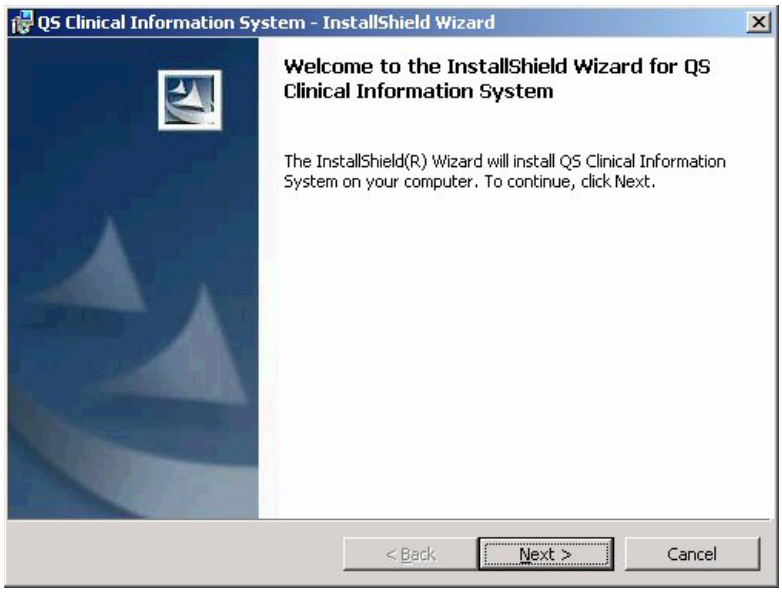

QS Clinical Information System - InstallShield Wizard
Welcome to the InstallShield Wizard for QS Clinical Information System
The InstallShield(R) Wizard will install QS Clinical Information System on your computer. To continue, click Next.
< Back
Next >
Cancel

Figure 5: Welcome to the InstallShield Wizard for QS Clinical Information System Dialog Box

3. Click **Next**.

   The Workstation Install dialog box is displayed.

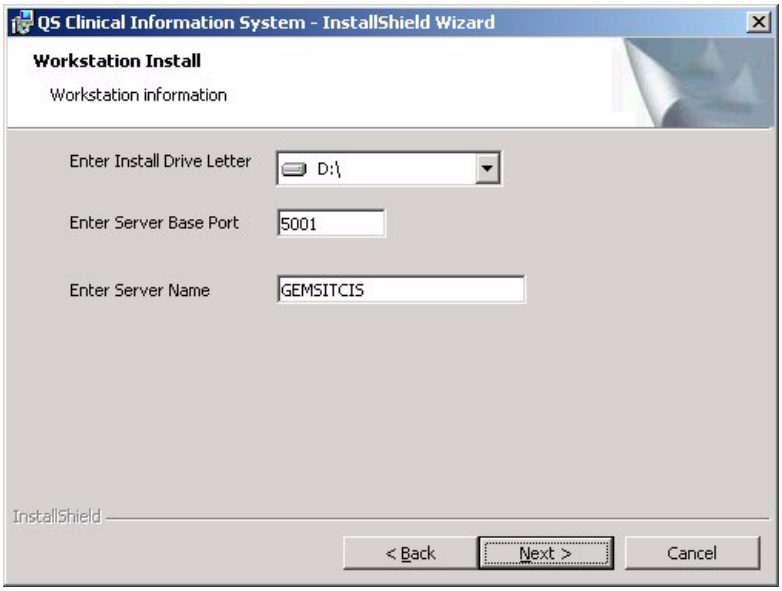


Figure 6: Workstation Install Dialog Box

4. In the **Enter Install Drive Letter** list, select the drive where you want to install the QS Client.
5. In the **Enter Server Base Port** text box, type the base port.

   The base port is the port number where the QS Server processes broadcast data messages and listen for connections

from the clients. This port is defaulted to 5001, but may vary from site to site.

6. In the **Enter Server Name** text box, type the server name.

   The Server Name is the computer name of the QS Primary Server. QS Servers shipped from GE have the default computer name as GEMSITCIS, but can vary from site to site.

7. Click **Next**.

   The Ready to Install the Program dialog box is displayed.

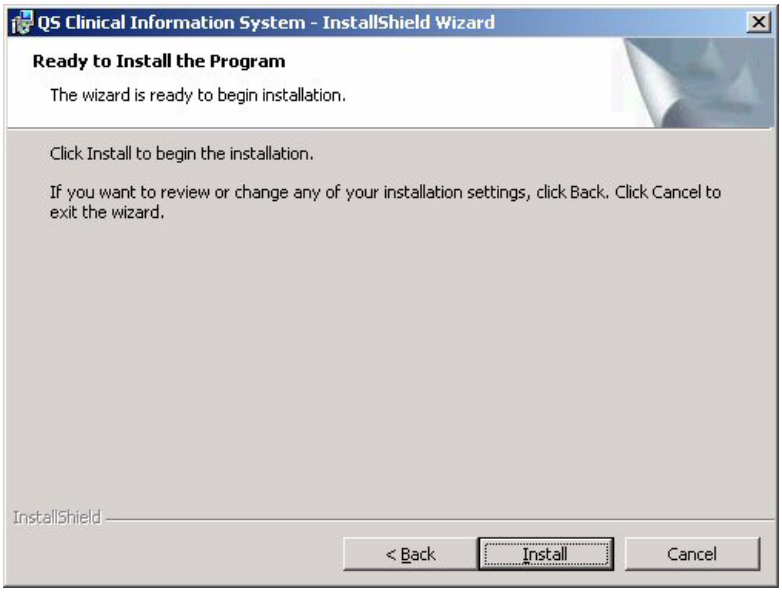

QS Clinical Information System - InstallShield Wizard
Ready to Install the Program
The wizard is ready to begin installation.
Click Install to begin the installation.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
InstallShield
< Back
Install
Cancel

Figure 7: Ready to Install the Program Dialog Box

8. Verify the installation information that is displayed, then click **Install**.

   The Installing QS Clinical Information System dialog box is displayed.

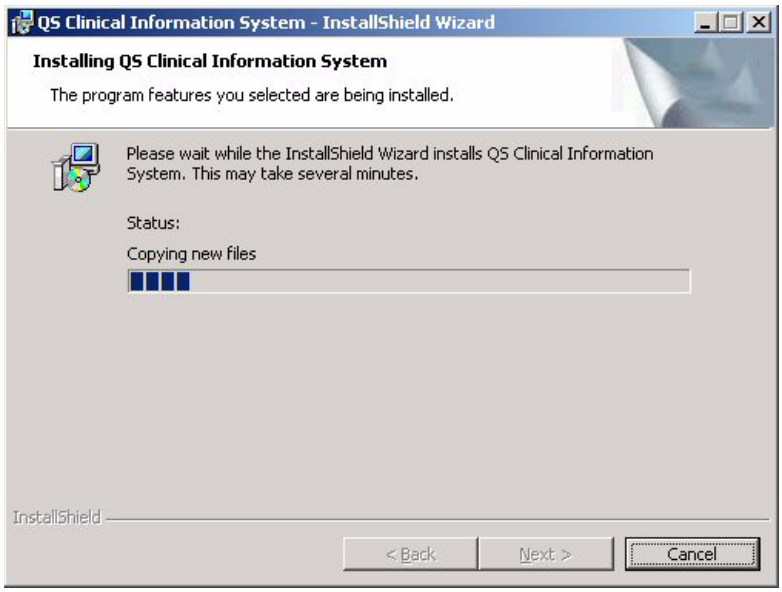

QS Clinical Information System - InstallShield Wizard
Installing QS Clinical Information System
The program features you selected are being installed.
Please wait while the InstallShield Wizard installs QS Clinical Information System. This may take several minutes.
Status:
Copying new files
InstallShield
< Back
Next >
Cancel

Figure 8: Installing QS Clinical Information System Dialog Box

9. Wait while the QS Client is installed on the workstation.

   Once the client is installed, the InstallShield Wizard Completed dialog box is displayed.

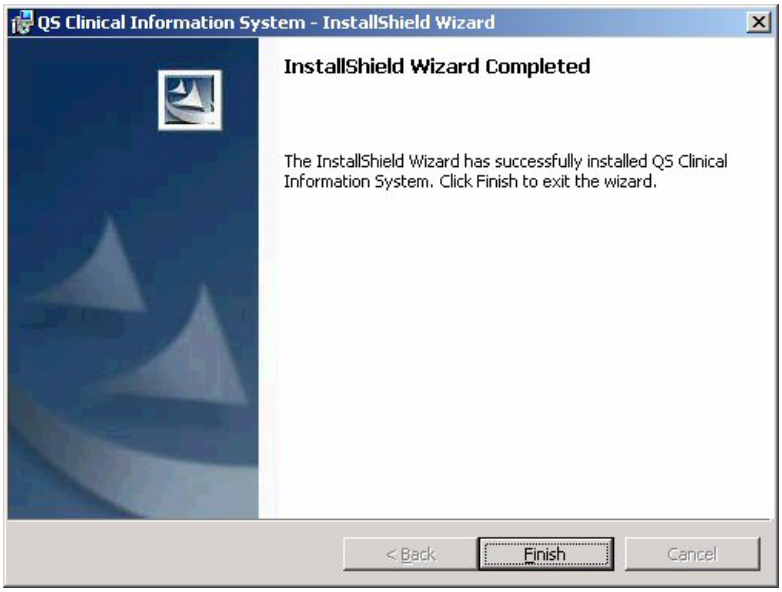

QS Clinical Information System - InstallShield Wizard
InstallShield Wizard Completed
The InstallShield Wizard has successfully installed QS Clinical Information System. Click Finish to exit the wizard.
< Back
Finish
Cancel

Figure 9: InstallShield Wizard Completed Dialog Box

10. Click **Finish**.

    The QS Clinical Information System Installer Information dialog box is displayed.

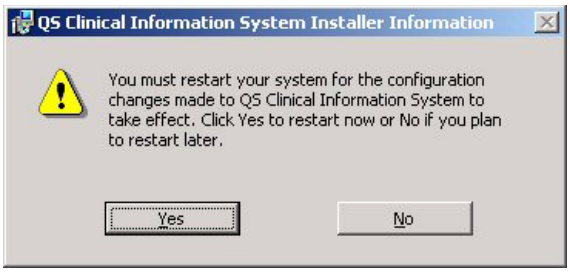

QS Clinical Information System Installer Information
You must restart your system for the configuration changes made to QS Clinical Information System to take effect. Click Yes to restart now or No if you plan to restart later.
Yes
No

Figure 10: QS Clinical Information System Installer Information Dialog Box

11. To complete the install, you must restart the workstation. To restart the workstation now, click **Yes**.
12. After the workstation is restarted, the client installation is completed.

    To install the QS Client software on another workstation, repeat these directions on that workstation.

Installation procedure from the command line

To complete the client workstation software installation process, perform the following steps.

1. Insert the QS Client CD into the CD-ROM drive of the workstation being configured.
2. Access a command prompt and change the directory to match that of the CD-ROM drive.
3. Start the automated installation process using the following command structure.

   ```
   Installqs D: Y QSUSER
   ```

   The command reflects the use of normal parameters. Each parameter is separated from the others by a single-space. Each command element may be modified in accordance with the information in Table 14.

Table 14: Installation Command Parameters

Parameter	*Description*
Target Drive (***D***: in the example)	This paragraph designates the drive to which the QS software will be copied (loaded). The acceptable range of inputs is from ***C:*** to ***Z:***. This component MUST consist of a drive letter and a colon - example ***C:***, ***D:***, ***E:***, and so forth.
Local Accounts (***Y*** - normal selection)	Acceptable inputs are either ***Y*** or ***N***. • Enter ***Y*** (yes) if accounts are to be created on this client workstation. • Enter ***N*** (no) if this workstation will be part of a domain structure where there is no need for accounts on this workstation.

Table 14: Installation Command Parameters (Continued)

Parameter	*Description*
Autologon / Autostart (***QSUSER*** - normal selection)	Acceptable inputs are ***QSUSER***, ***ALL***, and ***NONE***. • ***QSUSER*** will autologon to the system at boot-time and start QPM. • ***ALL*** will not autologon at boot-time, but will start QPM for any user who logs into the workstation. • ***NONE*** will not autologon to the workstation at boot-time and will not start QPM for users who log into the workstation.

4. After the installation (configuration) process has been completed, remove the **QS Client CD** from the workstation drive.
5. Close the **Command Prompt** window.

NOTE: QSUSER is automatically added to the **Power Users** group as part of the installation process. If the workstation is configured with Microsoft Windows 2000 or 2003, proceed directly to step 7. If the workstation is configured with Microsoft Windows NT then Step 6 needs to be performed.

6. If the workstation is configured with the Microsoft Windows NT operating system, you must remove **QSUSER** from the Power Users group through the use of the **Administrative Tools > User Manager** capability.
7. Right-click an unoccupied area of the displayed desktop and select **Properties**.
8. Click the **Settings** tab and make sure that the following options are set as indicated:
   - DESKTOP AREA—set for a resolution of 1024 x 768
   - COLOR PALETTE—256 colors
9. Reboot the client workstation.
10. Right-click the task bar, select **Properties**, and make sure that the following options are set as indicated:
    - AUTO HIDE enabled (check mark visible)
    - ALWAYS ON TOP disabled (no check mark)
11. Acknowledge all messages (including the welcome message) during reboot.

NOTE: If the client workstation is configured with the Microsoft Windows 2000 or 2003 Professional operating system, you will need to perform step 12 to ensure that all of the fonts installed during start-up are activated.

12. After the **QPM** application is running, perform a manual system shutdown and then reboot the workstation.

Software Upgrades

The QS is periodically modified to correct operational anomalies and incorporate new feature sets in an attempt to best serve the needs of our customers. These modifications are automatically installed as part of a new installation; however, previously installed QS configurations will need to be upgraded in order for the features/capabilities of a particular QS release to be available.

Upgrade Process

Upgrades are provided free of charge to all customers either still under warranty or in possession of an active (unexpired) *software service agreement* (SSA). Customers that are neither under warranty nor in possession of a valid service agreement may still obtain upgrades; however they will need to initiate the process by contacting a QS sales representative.

Release Notes

The various features and fixes associated with a new QS upgrade are described in version-specific *release notes* that are delivered by mail and/or email to primary customer contacts at each facility. These release notes are generally delivered once the associated QS release has become available.

Additional costs

Generally, there are no additional costs associated with a QS upgrade for customers possessing a valid warranty or SSA. However, should an upgrade require any of the following items/services, the associated costs will be the responsibility of the customer.

- Procurement and installation of new hardware.
- Training to address use of the new features.
- Project management, corrective actions or services requiring a GE representative to travel to the customer facility.

NOTE: Upgrades are free to SSA customers, however some features do not come free with the upgrade.

Installation

The installation of a QS upgrade is generally performed remotely by GE personnel via a dedicated remote connection.

Personnel requirements

The normal upgrade process is performed almost entirely by a GE employee. However, a staff member at the facility being upgraded will be required to load the upgrade CD-R disc into the QS server workstation. Also, a staff member or two (preferably someone from IT and a System Manager) should be on site during the course of the upgrade for any hands-on assistance.

System down-time

The upgrade process involves suspension of QS system operations in order to perform system-cycling (rebooting) and other necessary procedures. Customers should be prepared for a period of disruption approaching eight (8) hours. Actual length of the disruption is determined by many factors such as the size and complexity of the installed QS configuration. Please be aware of the fact that GE Customer Support personnel will make every effort to minimize the duration of system non-availability.

Upgrading sites not under warranty (without a valid SSA)

Customers without either a warranty or valid SSA should contact a QS sales representative at the following number to obtain information about obtaining the desired QS upgrade.

QS Sales 1-866-664-8677 option **3**

Upgrading sites under warranty (with a valid SSA)

The process that these customers should use to obtain a QS upgrade is described as follows:

1. **Customer** initiates a call to QS Customer Support (see listing) to request an upgrade.
2. **QS Customer Support** verifies that the customer either has a valid service agreement or is still under warranty.
3. If in possession of a valid warranty or SSA - **QS Customer Support** logs the request into the call log and an *Upgrade Preparation Checklist* (see Table 15), which must be completed prior to scheduling of the upgrade, is faxed to the customer.
4. The **Customer** completes and returns the checklist to QS Customer Support.
5. **QS Customer Support** contacts the customer soon after the completed checklist is received and reviewed to schedule the upgrade.
6. **QS Customer Support** ships an upgrade CD-R disc to the customer.
7. **QS Customer Support** orders documentation appropriate for the requested upgrade and has it shipped to the customer.
8. **QS Customer Support** performs the upgrade on the previously scheduled date.

Upgrade Preparation Checklist

The following table provides an example of the upgrade preparation checklist normally provided by QS Customer Support.

NOTE: This checklist is not a replacement for the one provided by your QS Project Manager.

NOTE: Please contact QS Customer Support should your facility desire to upgrade your current QS configuration. Do not use the example checklist that follows as its content may no longer be appropriate.

Table 15: Example Upgrade Preparation Checklist

COMPLETED (Yes or No)	STEP	COMMENTS
Contact Information		
	1. Do you have a GEMS-IT Software Services Agreement (SSA) signed?	***If No***, please contact your sales rep to sign the SSA before you are eligible for the upgrade
	2. Who are the Points of Contact for upgrade – including email, phone, pagers, and fax numbers: • System Manager • Clinical Perinatal Director • IT Director involved in this upgrade (if different from System Manager)	You should coordinate with each of them to ensure they are aware of upgrade & know what, if anything, is needed of them before or during the upgrade process
	3. Do you want CD upgrade information shipped prior to upgrade	If Yes, provide name and address if different than currently identified key contact
	4. Should Documentation Manuals be shipped to same POC & Address as upgrade CD?	***If No***, provide name, address, phone, & email address
Readiness Assessment (OS/2 vs NT, Clients vs Servers, Domain Environment)		
	5. What is your current QS version?	If you are on version prior to 5.06, this upgrade may be a 2 step upgrade process if you are not purchasing new servers (see step #11 below)
	6. Is site using any OS/2 clients or servers for ANY processes below:	
	• Printing	1. ***If yes***, then you must convert all PLDs, Forms and Charts from OS/2 to NT in order to print; 2. Will you have this conversion completed prior to your scheduled upgrade? 3. What is the scheduled date for this conversion to occur _____
	• Archiving	1. ***If yes***, are you using WORM drives? 2. Have you ordered QS ACT services for converting platters to CD? 3. When do you plan to send your optical platters to GE
	• Faxing	***If yes***, then same process as Printing
	• Chalkboards	***If yes***, then same process as Printing

Table 15: Example Upgrade Preparation Checklist (Continued)

COMPLETED (Yes or No)	STEP	COMMENTS
	• Spectra-Tel (Previous Version of Physician's Remote Access)	***If yes***, then hospital needs to purchase OB Link
	7. Are you using Old Style Fluids?	***If yes***, then you will ultimately need to convert to New Style fluids by reentering all data. **NOTE**: You can proceed with the overall upgrade without completing this segment; however, you will not be able to print any fluid information after upgrade conversion.
	8. If you are not sure about your OS/2 status, please take the steps outlined to the right and do not proceed with this Checklist until these steps are completed.	1. Test each of the processes noted above (step 6) after turning off your OS/2 server and clients. If all your processes above work satisfactorily, then you are ready for the upgrade. 2. Contact Customer Support to confirm as necessary.
	9. Per OS/2 questions above (step 8), if you have confirmed that you have no servers and/or clients running OS/2, then are your servers and clients on **NT Service Pack 4** or above?	***If no***, you need to make arrangements with your IT department to have NT Service Pack 4 or above. **NOTE**: GE strongly recommends Service Pack 6a.
	10. Do you have a Backup and Loadshare Server	Complete the **Server & Workstation Validation Checklist** for Steps 10 through 14 to ensure you have appropriate server and client workstation hardware configurations to support QS 6.xx.x.
	11. Are you ordering new servers?	***If yes***, then you do not need to contact Customer Support to schedule your upgrade. Our manufacturing operations will deliver your existing site tables with the upgrade incorporated.
	12. Do you have sufficient RAM for each Server? See Table 11	***If no***, you need to upgrade the amount of RAM in all servers. **NOTE**: If the site purchases additional RAM from GE, then the QSIC or GE Service representative can install the RAM in the server. Otherwise, the site is responsible for installing the RAM.
	13. Are you ordering new client workstations?	If yes, then any new workstations provided by GE will come with Microsoft Windows 2003 Professional loaded. **NOTE**: Microsoft Windows 2003 workstations can coexist with Microsoft Windows NT workstations on the same network. However, you will not be able to use the new workstations until their configuration is upgraded to QS 6.xx.x.
	14. Do you have sufficient RAM for each client workstation? See Table 10.	***If no***, you need to upgrade the amount of RAM in ALL client workstations
	15. Is your site on a Domain?	If your QS system is running on the Hospital domain and you have made changes to the original QS setup, then your upgrade performance may be more complicated

Table 15: Example Upgrade Preparation Checklist (Continued)

COMPLETED (Yes or No)	STEP	COMMENTS
Upgrade Process (OS/2 vs NT, Clients vs Servers, Domain vs Workgroup Environment)		
	16. Have you planned for your system to be unavailable?	You will need to make arrangements for manual backup processes and try not to schedule critical surgeries on the day of the upgrade. Installation time will vary depending on the complexity of the system configuration.
	17. Do you want your HIPAA license turned on with Security & Audit Trail reporting enabled during the upgrade?	***If no,*** then you must request this step from Customer Support at a later time.
	18. Do you want your HIPAA Audit Logging to the Security & Privacy Event Database enabled?	
	19. Have you evaluated the new QS 6.xx.x clinical content database with your sales representative or Inside Sales?	
	20. Are you aware that you will **NOT** be receiving the new clinical content database with the standard software upgrade performed by Customer Support?	If you select a **full system replacement** and maintain your current clinical database, then you will also not receive the new clinical database.
	21. GE Customer Support will pull PLD forms and charts for conversion from OS/2 to NT.	GE is responsible for this step if the hospital obtains GE customization services. The system will be “locked” for any changes at this time. If any system changes and/or new users are added, they will also need to be inserted into the new system.
	22. Have your PLD form and chart updates been completed?	
	23. **For printing** - Attach new NT PLD templates for forms and charts to the Designer Chart & Form view	
Other Considerations		
	24. Hospital agrees to perform testing and/or validation after upgrade, system replacement or clinical database replacement.	
	25. **Enabling Required Items** - Are you aware that you will need to build your own Required Item Rules and Rule Sets? Do you need to purchase GE customization services after the upgrade to complete this step?	Only the functionality exists via Designer to enable you to create your custom rules.
	26. **Enabling HIPAA PHI** - Are you aware that you will need to define your own "Protected Health Information" based on your hospital's definition of PHI? Do you need to purchase GE customization services after the upgrade to complete this step?	Only the functionality exists via Designer to enable you to identify and customize PHI at the item level and provide appropriate authority to select users for print & fax.
	27. If you select clinical **Database replacement**, are you aware that **you will lose** any customization previously completed?	Additional customization services (for a fee) are available through the GE IT Professional Services team.

Table 15: Example Upgrade Preparation Checklist (Continued)

COMPLETED (Yes or No)	STEP	COMMENTS
	28. Training for System Manager or End Users can be purchased from GE's IT Professional Services Group	Because of the availability of QS 6.xx.x documentation, we do not anticipate the necessity for any end user/site training.
	29. **ADT & Lab Interfaces** - what interfaces are present currently?	
	30. **Physiologic Monitor Interfaces** (fetal monitor, EKG, etc) - what interfaces are present currently (HP Careport)?	
	31. **Is your site running Token Ring**?	***If yes***, your hospital must convert to ethernet cabling as part of the conversion process.
	32. **Is your site purchasing new maternal/fetal monitors** as part of this conversion process?	***If yes***, then new cabling may be required.
	33. **Do you use CoroLan cabling**?	***If yes***, your hospital must have their Corolan networks replaced & rewired with the serial Equinox system as part of their OS/2 conversion to NT - regardless of which migration path they select. Corolan is no longer supported with the QS product since it requires an OS/2 workstation in order to operate.

Chapter 5: Preventive Maintenance

Preventive maintenance focuses upon the cleaning and periodic servicing of the 3rd party equipment that hosts and supports the operation of the QS system. These tasks are repeated at specified intervals to ensure that each piece of equipment operates in the prescribed manner for the entirety of its anticipated life-cycle.

What do you want to learn about?

GE Recommendations (page 119)

Database Maintenance (page 120)

The QS and Third Party Software (page 121)

Patches (page 128)

Licensing (page 130)

6.70.5 Release Specifications (page 130)

GE Recommendations

Preventative maintenance tasks are defined by the manufacturer of each piece of equipment (for example, workstation CPU or monitor). You should familiarize yourself with each of the suggested preventative maintenance tasks and ensure that they are scheduled for performance in accordance with manufacturer guidelines. You should also periodically perform the following tasks as a supplement to manufacturer recommendations.

NOTE: The following recommendations are intended to supplement those of the individual equipment manufacturers as well as the established policies of your facility. Please consult with your IT representative should you have any questions about the following guidelines.

1. Ensure that electrical cables do not exhibit any visual signs of damage—broken connectors (plugs), worn or damaged insulation, and so on.
2. Ensure that all electrical connections are made to approved outlets (power sources).
3. Ensure that sufficient ventilation exists for all electrical equipment. Electrical equipment should not be located in enclosed spaces with restricted air-flow. Failure to comply with this recommendation could result in decreased performance, equipment failure, and the creation of a potential fire hazard.
4. Ensure that cooling vents and fan openings are not obstructed by debris build-up (dust, lint, and so forth). Failure to comply

with this recommendation could result in decreased performance, equipment failure, and the creation of a potential fire hazard.

5. Ensure that equipment is safely mounted on stable surfaces. Improper stowage (physical instability) could result in personnel or patient injury, or equipment damage.
6. Ensure that QS equipment is included in the established cleaning and disinfecting programs in place at your facility.

Database Maintenance

Regular maintenance of all Centricity Perinatal (QS) databases is critical in ensuring that your database performs well. This includes regularly backing up the Database in case of system failure as well as checking for inconsistencies.

Environmental factors such as power outages and fluctuations, improper closing of Microsoft Access, and disk or network failures may leave your database file damaged. The Repair and Compact utilities in Microsoft Access are useful tools for recovering and optimizing Microsoft Access database files.

Centricity Perinatal (QS) is already equipped to do a regular compacting and backup of all databases. All QS databases are compressed and zipped and exist in D:\QS\Backup. This includes the site tables which contain all site configurations:

- Birthlogs are made up of InfantExport.mdb and MotherExport.mdb. Birthlogs are backed up and zipped using the PtD jobs.
- SecurityAuditTrail.mdb gets backed up using the AuditTrail.Bat which is part of the AT job.
- Archive.mdb is backed up with the archive process. Archive.mdb also gets backed up to CD’s and/or Hard Drive along with all patient files.
- CDATS.zip contains the site tables that are backed up in the QS Archive process when using the Archive to CD-R option. They do not get backed up when using the Archive to Hard Drive option.

Customers are responsible for:

- Regularly backing-up the content of D:\QS\Backup
- Ensuring that nobody opens a LIVE database
- Protecting all QS databases from unauthorized changes or alterations
- Installing and updating operating system patches
- Installing routine anti-virus updates
- Installation and maintenance of other software not validated by GE

GE strongly suggests that sites create a test environment and establish acceptance test criteria prior to installing on a production environment.

The QS and Third Party Software

GE Healthcare Information Technologies Anti-Virus Software Policy

It is the responsibility of the customer IT staff and/or biomedical engineers to select and install anti-virus protection software. GEHC-IT recommends using Symantec's Norton AntiVirus Corporate Edition software. With each new product release, GEHC-IT will validate the latest release of the Norton AntiVirus Corporate Edition software available at the start of the validation process. Customers are encouraged to verify with GEHC-IT Product Service or Technical Support what version of anti-virus software has been validated to protect their system. Customers should upgrade to the most recent product release to ensure that their system is validated with the most recent Norton AntiVirus software. The validated version of Norton AntiVirus software is listed in each product Release Note. It is the customer's responsibility to perform routine anti-virus software definition updates.

NOTE: Customers who wish to incorporate the Norton AntiVirus software on their Centricity® Perinatal Systems (QS) should be made aware that an anomaly has been discovered associated with the use of Norton AntiVirus Corporate Edition software on NT Operating System. The noted anomaly changes the attributes associated with two files required for proper operation of Smart Storage Smart CD software used for the Centricity® Perinatal System (QS) archiving operations on Microsoft Windows NT servers. This issue is not evident under Microsoft Windows 2000 or 2003. Information about configuring Norton AntiVirus Corporate Edition software to prevent the occurrence of this anomaly is available in the Conflict Prevention (Norton AntiVirus/Smart Storage) information sheet in the Quantitative Sentinel® Configuration Reference Manual (08046-002).

Please note that customers are solely responsible for—and GE specifically disclaims responsibility for—any defect or deficiency in the QS System that results from the implementation of modifications to the Centricity® Perinatal System (QS) or the operating system software that have not been specifically validated by GE.

We hope that this information is received by customers in the way it was intended—as positive, useful guidance. With the recent heightened concerns about worm viruses and their possible effects on systems of all types, it becomes more important than ever that open communication occur between GE and our IB customers.

Global Virus Scanning

QS System Managers and users need to be aware of the threats posed by importing files of unknown origin onto their computer system(s). Files of unknown origins are a cause of computer viruses that disrupt system operation and corrupt/destroy valuable information.

To decrease your site's vulnerability to computer viruses, GE encourages site staff members—QS System Managers, users, members of the site's information systems support staff, and so on—to augment their internal policies and procedures, to address introduction of external files, and to plan the integration and use of a virus scanning tool.

GE develops, operates, and maintains the QS on workstations configured with Norton Antivirus™ Corporate Edition. Sites desiring to incorporate a virus scanning tool into their QS client and server workstation configurations must be aware of the following:

1. Responsibility for selecting, installing and maintaining virus-scanning software is the sole responsibility of the site.
2. Virus-scanning software must be updated regularly in order to cope with new viruses that are evolving almost daily. These updates are accomplished through the periodic refreshing of the virus-scanning data file (typically identifiable by the *.dat extension).
3. In addition to supplying information about newly discovered viruses, data files will occasionally introduce operational changes into the virus-scanning engine itself. These changes have the potential to affect the compatibility of the selected virus-scanning software and the QS.

Files that should be scanned

Symantec Norton Anti-Virus 8.0, 10.0 Client has been tested with this version of the QS software. If you opt to use this third-party application on the workstations with the QS software, GE recommends the following configuration:

Scan the following extensions:

386, BAT, BIN, BTM, CLA, COM, CSC, DLL, DRV, EXE, OCX, OV*, PIF, SYS, VBE, VBS, and VXD

Optional: Set the CPU utilization under Scan, Options to Low.

Optional: Exclude .btr files, QS Log files and the active patient database.

The following folders contain files that would not normally be targeted by viruses; they contain no executable files or DLLs. Excluding these directories will help ensure that the virus scan engine will not affect the system operation.

These directories apply to Win2k primary/backup/cluster servers.

- Database directory: D:\QS\SITE

- Patient file directory: D:\QS\PFILS
- Birth & HIPAA Log directory: D:\QS\MSACCESS
- Patient file Archive directory: D:\QS\ARCHIVE
- Patient file Archive directory: D:\QS\Logs (and sub dirs)
- Backup PFILS Z:\ (or whatever backup drive is set to)

These directories apply to NT4 primary/backup servers

- Database directory: D:\QS\SITE
- Patient file Archive directory: D:\QS\Logs (and sub dirs)
- Backup PFILS Z:\ (or whatever backup drive is set to)
- Patient file directory: E:\QS\PFILS
- Birth & HIPAA Log directory: E:\QS\MSACCESS
- Patient file Archive directory: E:\QS\ARCHIVE

Known anomalies

Currently, there is only one anomaly associated with the use of the Norton Antivirus™ software in conjunction with the QS operation. The noted anomaly changes the attributes associated with two files required for proper operation of SmartStorage SmartCD software used for QS system archiving operations when configured with the Microsoft Windows® NT operating system. QS configurations employing the Microsoft Windows 2000, XP, or 2003 operating system are not effected by this anomaly.

The following procedure was employed with the following software versions. Use of software whose versions differ with those described herein will likely follow a similar pattern.

- Norton Antivirus Corporate Edition - Version 7.02
- SmartStorage Smart CD - Version 3.01

Should you have questions about this procedure or other version applicability issues, please contact GE Customer Support.

Please note that this anomaly only affects virus scans defined as part of the Norton Antivirus configuration. It does not affect Realtime File System Protection (active scans) enabled by clicking the right-mouse-button over the Norton Anti-virus icon (located in the system tray at the right-side of the Window’s taskbar).

The existence of this anomaly and its disruption of the QS archiving capability may be avoided by excluding the mkdemsg.log and mkdewe.trn files from the Norton Anti-virus scanning process.

Exclusion of these files from virus scanning and the prevention of the archiving anomaly requires a modification to the Norton

Antivirus program settings. The modification of these settings is described as follows:

1. Select **Norton Antivirus Corporate Edition** from the programs listing (accessed via the **Start** button on the windows taskbar).

   A dialog similar to Figure 1 on page 124 will be displayed.

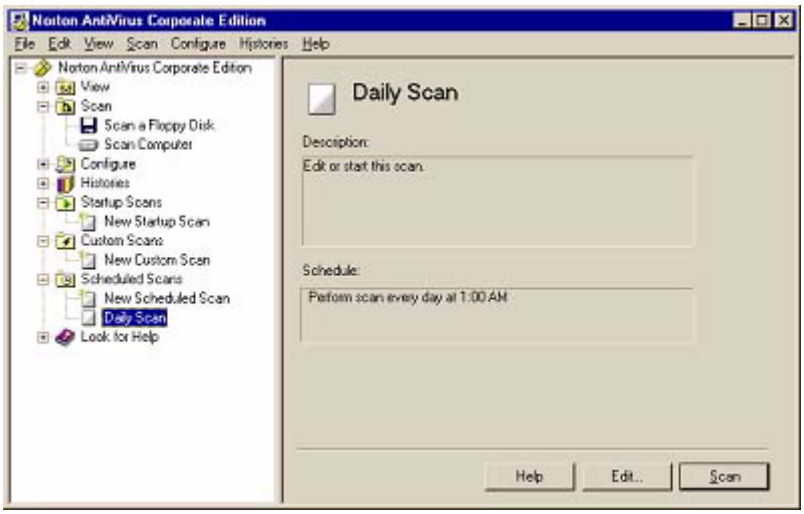


Figure 1: Norton Antivirus Corporate Edition - Initial Dialog

NOTE: The presence of a minus sign (-) to the immediate left of a folder indicates that the folder is opened and that its contents are available for viewing/accessing.

2. Open the **Startup Scans**, **Custom Scans**, and **Scheduled Scans** folders by clicking over the plus sign (+) to the immediate left of each folder.

   NOTE: New Startup Scan, New Custom Scan, and New Scheduled Scan are templates for defining new scan settings and do not require modification in the following steps.

3. Select a defined scan (for example, **Daily Scan** in Figure 1 on page 124).
4. Click **Edit**.

   A **Scan** dialog similar to Figure 2 on page 125 will be displayed.

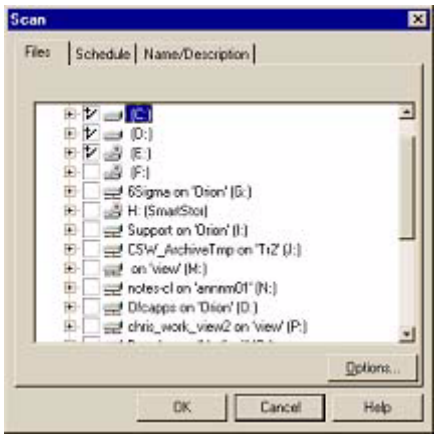


Figure 2: Initial Scan Dialog

NOTE: The presence of a minus sign (-) to the immediate left of a drive icon indicates that its contents are available for viewing/accessing.

5. Open the **C:** drive by clicking over the plus sign (+) to the immediate left of its drive icon.

   A contents listing similar to that of Figure 3 on page 125 will be displayed within the **Scan** dialog.

Figure 3: Scan Dialog - File Listing

6. Uncheck the files **MKDEMSG.LOG** and **MKDEWE.TRN**.
7. Click **Options**.

   The **Scan Options** dialog (similar to Figure 4 on page 126) will be displayed.

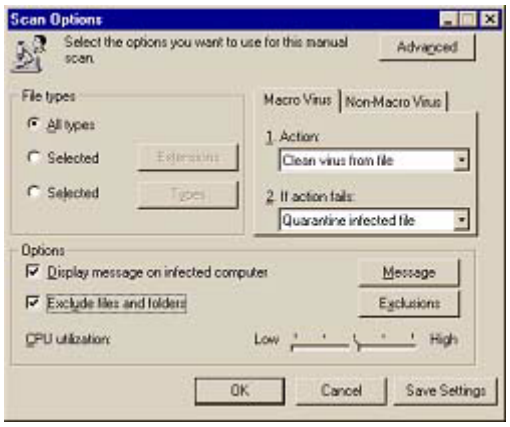


Figure 4: Scan Options Dialog

8. Check **Exclude files and folders**.
9. Click **Exclusions**.

   The **Select Items** dialog (similar to Figure 5 on page 126) will be displayed.

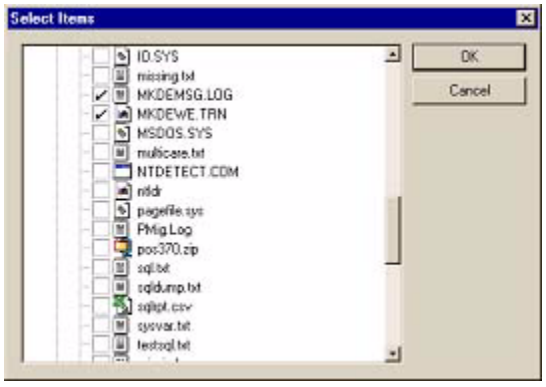


Figure 5: Select Items Dialog

10. Check **MKDEMSG.LOG** and **MKDEWE.TRN**.
11. Click **OK** (Figure 5 on page 126).
12. Click **Save Settings** (Figure 4 on page 126).
13. Click **OK** (Figure 4 on page 126).
14. Click **OK** (Figure 3 on page 125).
15. Click **OK** (Figure 2 on page 125).

    NOTE: Repeat steps 3 through 15 for every defined scan (startup, custom, and scheduled) until all configured scans have been modified to exclude the mkdemsg.log and mkdewe.trn files. Only then should you proceed to step 16.

16. From the **File** menu, select **Exit** (Figure 1 on page 124).

Norton Anti-Virus 8.0 Client

Symantec Norton Anti-Virus 8.0 Client has been tested with this version of the QS software. If you opt to use this third-party application on the workstations with the QS software, GE recommends the following configuration:

For ALL Systems

Ensure that both Real-Time and Scheduled scans are configured.

- Scan the following extensions:

  `386, BAT, BIN, BTM, CLA, COM, CSC, DLL, DRV, EXE, OCX, OV*, PIF, SYS, VBE, VBS, and VXD`

- Exclude the following extensions:

  `V01, S01, 000-009, GZ, 00-10, 000-010, MDB`

- Optional:

  Set the CPU utilization under Scan, Options to Low

For primary/backup/cluster servers with Microsoft Windows 2000 or 2003 operating system

Exclude the following files and/or directories:

NOTE: These folders contain files that would not normally be targeted by viruses; they contain no executable files or DLLs. Excluding these files and/or directories will help ensure that the virus scan engine will not affect the system operation.

- Database directory: `D:\QS\SITE`
- Patient file directory: `D:\QS\PFILS`
- Birth & HIPAA Log directory: `D:\QS\MSACCESS`
- Patient file Archive directory: `D:\QS\ARCHIVE`
- Patient file Archive directory: `D:\QS\Logs` (and sub directories)
- Interface/MUSE software: `D:\Vol000`
- Interface/MUSE software: `U:\`

For primary/backup servers with Microsoft Windows NT4 operating system

Exclude the following files and/or directories:

NOTE: These folders contain files that would not normally be targeted by viruses; they contain no executable files or DLLs. Excluding these files and/or directories will help ensure that the virus scan engine will not affect the system operation.

- `C:\MKDEMSG.LOG`
- `C:\MKDEWE.TRN`
- `C:\SmartstorAA` (any directory that contains *.BTR files)
- Database directory: `D:\QS\SITE`
- Patient file Archive directory: `D:\QS\Logs` (and sub directories)

- Patient file directory: `E:\QS\PFILS`
- Birth & HIPAA Log directory: `E:\QS\MSACCESS`
- Patient file Archive directory: `E:\QS\ARCHIVE`
- Interface/MUSE software: `D:\Vol000`
- Interface/MUSE software: `U:\`

For all servers and all QS client workstations regardless of operating system

Exclude the following files:

NOTE: `Hidden.exe` is not a virus but there is a virus that may create a file of the same name, thus, the anti-virus software detects it as a potential virus and quarantines the file.

If this occurs, PDATS will not run on the workstation and, if multiple workstations are affected, could cause the entire system to stop functioning.

- `C:\QS\Tools\Hidden.exe` or `D:\QS\Tools\Hidden.exe`
  If scanning within compressed files:
- `C:\QS\Tools\T####L##.exe` Example: T6700L10 **or**
- `D:\QS\Tools\T####L##.exe` Example: T6700L10 **and**
- `D:\QS\Release\NT\T####:##.exe` (primary/backup servers only)

NOTE: The `T####L##.exe` file names will need to be updated with each upgrade of the QS application.

Patches

GE Healthcare Information Technologies Security Patches Policy

GEHC-IT has developed a security vulnerability assessment policy. This policy includes taking the following actions whenever new vulnerability and corresponding patch availability is announced:

- The GEHC-IT engineering team performs risk, vulnerability, and impact assessments to determine if the announced vulnerability impacts the product.
- If the vulnerability is identified as critical and as having a direct impact on GEHC products, GEHC will disclose—typically within 48 hours—product vulnerability on the GEHC corporate Web site at this URL:

`http://apps.gehealthcare.com/product_security/protection/prod_sec_home.html`

- If the vulnerability is critical, The GEHC-IT CIS team will perform emergency product validation on the new software patch to determine how it affects the product code. GEHC-IT

will, at a minimum, validate the patch against the most recent product release.

- If the vulnerability is not critical and does not affect the product, the security patch will be scheduled for validation at the next product release.

It is the responsibility of the customer IT staff and/or biomedical engineers to install all security patches. The customer is encouraged to verify with Product Service or Technical Support the product versions that has been validated with the new software patch. GEHC-IT encourages customers to upgrade to the most recent product release to ensure that their product is fully functional, secure, and safe. The Release Notes for each new product will contain a list of all the validated security patches.

Customers will be responsible for staying informed about vulnerability notifications from Microsoft and to visit the GEHC Product Security Web site to understand the impacts on GEHC products. Microsoft patches are available for download from Microsoft's Web site at this URL:

`http://www.microsoft.com/technet/security/default.mspx`

Customers are responsible for all changes made to operating systems and/or databases installed on the GEHC-IT Centricity® Information Systems including selecting, installing, and maintaining patches for any third party software.

Microsoft Patches

Since the QS employs the Microsoft Windows® operating system, GE engineers evaluate operating system and security patches made available by Microsoft as part of service packs for their applicability prior to releasing QS upgrades. These service packs are installed only if they are found to (1) improve QS performance, (2) improve the reliability and stability of the Microsoft Windows operating system, or (3) improve system security. GE will not use a service pack simply because it is available.

Individual operating system and security patches are provided periodically on the Microsoft Web site that may be downloaded and integrated into the operating systems of interested users. Sites contemplating the incorporation of a Microsoft patch should consider the following:

1. GE does not evaluate or recommend all patches that become available on the Microsoft Web site.
2. Installation of individual patches is the sole responsibility of the site. While individual patches address the issues stated in their Web site descriptions, they also have the potential to introduce operational anomalies. These anomalies could be manifested as a relatively minor nuisance; however, they could render the associated workstation(s) unusable.

3. Restoration of individual workstations to their previous operational state–the one that existed prior to patch installation–may not be possible without assistance of GE Customer Support.

Contact GE Customer Support (1-800-433-2009) if you have questions about the compatibility of a specific Microsoft patch and the QS.

Licensing

The QS makes use of third party applications to extend the functionality of the QS software on the Microsoft Windows platform. Some of these third party applications must be registered with their respective vendors to function. The end-user must register these packages so that they can provide information to the vendor and receive support from the vendor. Instructions on how to register the software are included in the original software boxes that are delivered with the system. Your hospital IT department may be helpful in registering this software. The QS currently uses two third party packages that will stop functioning after a certain number of uses or a set amount of time if they are not registered:

- Microsoft Access 2002

The Microsoft Access 2002 database that is loaded on the System Managers workstation for use by the BirthLog and by the HIPAA Security Event database. The Microsoft Access database system will prompt the user with the number of startups left before the install license expires. If this software is not registered with Microsoft before the counter reaches zero, the end user will not be able to access the BirthLog or HIPAA Security Event Database until it is licensed.

- CA Arcserve 2000

The second package that needs to be registered is the CA Arcserve 2000 tape backup software. This software is loaded on the main server and backup server if tape drives are purchased as part of the QS system. This software will present messages on the server if it is not registered and will stop functioning 30 days after its initial installation on the servers.

6.70.5 Release Specifications

Server Specifications

General Requirements for system UPGRADES to QS 6.70.5:

- Server operates Microsoft Windows NT 4(SP6), Microsoft Windows 2000 (SP4), or Microsoft Windows 2003 (SP1)
- Server runs Quantitative Sentinel

- Server operates on TCP/IP based Networks
- Operating system partition 2 GB or more
- QS configuration and data storage 4 GB or more
- Intel Pentium III (or compatible) Microprocessor operating at 500 MHZ or higher
- 384 MB RAM or more
- 9 GB SCSI Storage Subsystem (RAID5 or Monolithic with a Spare)
- Hard Drive free space 4 GB or more
- 1024 x 768 x 256 color display subsystem or better
- UPS battery backup
- Keyboard and Microsoft Windows compatible pointing device
- CD-ROM Drive

Client Workstation Specifications

General Requirements for system UPGRADES to QS 6.70.5:

- System operates Microsoft Windows NT 4 (SP6), 2000 (SP4) or XP (SP2)
- System runs Quantitative Sentinel
- System operates on TCP/IP based networks
- Operating system partition 1 GB or more
- QS configuration and data storage 4 GB or more
- Video system supports 1024 x 768 x 16 bit or greater resolution
- Microsoft Windows desktop taskbar Always on Top disabled
- Microsoft Windows desktop taskbar Auto hide enabled
- Intel Pentium III (or compatible) Microprocessor operating at 400 MHz or greater
- Microsoft Windows NT 4 or Microsoft Windows 2000 with at least 128 MB RAM
- Microsoft Windows XP (SP1 or SP2) with 256 MB RAM or more
- 2.00 GB Storage Subsystem or greater
- Hard Drive free space 250 MB or more
- Display Monitor screen size 15" or greater capable of at least 60 Hertz refresh rate
- Keyboard and Microsoft Windows compatible pointing device

Additional Requirements for Perinatal Installations

- Capable of emitting audible alert tones

- Not shutdown (i.e. power-save disabled) the patient data display
- Support Internet Explorer 6.0 or later version
- Support Adobe Acrobat 4.0 or later version

Chapter 6: Data Backup

GE strongly recommends the use of a data backup system in conjunction with the QS. Without a backup mechanism in place, there exists the very real possibility that valuable information could be irretrievably lost. A data backup application should generally focus on safeguarding the patient database and the current system configuration.

Source of Backup Tools

GE has a backup tool designed to safeguard QS data at regularly scheduled intervals. You can make use of the GE backup tool, purchase an alternative solution from another software provider, or use a mechanism that may already be in place at your facility for archiving data.

You are encouraged to contact QS Technical Support for assistance in setting up the QS backup tool.

Data Backup Responsibility

Selection of a backup tool, development of a backup plan and determination of appropriate criteria (what to backup, how often, and so on) is the responsibility of the customer.

Important Considerations

GE views data backup as a critical daily function; however, each facility must determine the scheduling that best meets its needs.

Equally as important is the protection of the media containing the backup data. Some users take the additional precaution of making duplicate copies of all media and maintaining a second data archive in a different geographical location.

The following items should receive consideration when your site develops/modifies its backup plan.

1. The operating system (generally installed on drive `C:`) before any alterations are made to its installation/content.
2. QS system files and patient data on drive `D:` on Microsoft Windows 2000 or 2003 systems.
   The content of `E:` on older NT systems.

Chapter 7: System Failover

The MakePrimary and MakeBackup utilities replace the ConvertQS utility in QS Tools version T0103xx and older. These utilities will change the role of the QS servers from primary to backup and vice versa as indicated by their filenames.

What do you want to learn about?

Verify Backups to the BKSEVER (page 135)

Failover Process for a Single Server (page 136)

Failover Process for Cluster Servers (page 136)

Verify Backups to the BKSEVER

NOTE: The backup to the server needs to be verified in order to check whether or not the backup server's version of the QS software corresponds to the version of the QS software on the main server.

The following procedure describes how to verify the backups to the BKSERVER at regular intervals, which ensures if the current tables are being backed up to the backup server.

1. Verify the `\qs\site\back` folder on the backup and primary servers for the CDATS.zip file.
2. Verify the date and time stamp associated with that.zip file and ensure that the file is up-to-date.

   TIP: Starting from 7:30 A.M., the CDATS.zip file is copied to the backup server at an eight-hour interval.
3. Verify that the name and size of the files in the `\qs\release\nt` folder on the backup server match the name and size of the files in \qs\release\nt folder on the primary server.
4. Verify that the number of patient files in the `\qs\pfils` folder on the backup server match the number of files in the \qs\pfils folder on the primary server.
5. Verify that the files in the `\qs\pfils` folder on the backup server have the extension *.s01.

CAUTION: If the files on both the backup and primary servers are not verified, the old tables will exist on the backup server and the QS system will not be able to operate on the backup server.

NOTE: Call Technical Support to assist you with the verification process.

Failover Process for a Single Server

The following procedure describes how to perform a failover for a single server.

1. Verify that you need a failover by determining the server status. It is possible that the server is in a recoverable state.
2. The MakePrimary utility assumes that the Backup server has been connected for at least one backup cycle. (A backup cycle takes up to eight hours.) If it has not, failover will not be successful since the necessary configuration files will not be in place.

NOTE: Call Technical Support to assist you with the failover process.

Failover Process for Cluster Servers

The following procedures describe how to perform a failover for cluster servers.

Sequence for shifting cluster resources between nodes

NOTE: By default, the Archive drives are physically attached to the node 1 with a USB cable. If the nodes are shifted from node 1 to node 2, then archive CDs will not burn unless the USB cables are moved to node 2 or the nodes are shifted back to node 1.

To shift cluster resources between nodes

1. Click **Start**, and then point to **Programs** > **Administrative Tools** > **Cluster Administrator**.
2. Click '**+**' to expand **GEMSITCIS**.
3. Under **GEMSITCIS** >**Groups**> **Cluster Group**, click **Cluster Group**.
4. Examine the right side of the Cluster Administrator window and observe which node currently controls the resources under the column labeled Owner.
5. Use the **KVM switch** to select the node that is not the current resource owner.
6. Power off the node that is the current owner of the resources.
7. Wait for the resources to shift ownership (approximately 30 seconds).
8. Verify in **Cluster Administrator** that the **Owner** of the resources has shifted to the node that was not turned off.
9. Power on the node that was turned off.

10. Verify in the left window of Cluster Administrator that CISNODE1 and CISNODE2 both appear in an Up state (no red X's or ! warning signs).

    NOTE: Right-clicking on a node and selecting Properties will also display its current state.

    This completes the transfer process. To shift resources again, simply repeat the process.

NOTE: Call Technical Support to assist you with the failover process.

Stopping and starting the QS on the cluster server

CAUTION: Starting and stopping QS activity on the Cluster server is different from steps performed on the Single server. Failure to follow the detailed steps for the Cluster server may result in multiple instances of the QS running within the cluster.

NOTE: QSSERVER Service Startup Type always remains set to Manual.

NOTE: Click Services and set the following services to automatic mode:

- CV_SCM
- MSSQLSERVER
- SQLSERVERAGENT

CAUTION: Do not attempt to start or stop the QSSERVER Service from Services in Control Panel.

CAUTION: Do not attempt to start or stop the QSSERVER Service from the Command Line.

NOTE: Starting and Stopping the QSSERVER Service is always accomplished via the Cluster Administrator.

To stop the QS System

From either node in Cluster Administrator:

1. Right-click **QSSERVER**.
2. Select **Take Offline**.

From the node that is currently the Cluster Group Resource Owner:

3. Open a Command Line window, by clicking **Start** > **Run**.
4. Type **cmd** and click **OK**.
5. Type **stopqs** in the command prompt and press **Enter** to allow all QS processes to stop.

NOTE: A blinking cursor is displayed when all the QS processes have stopped.

To restart the QS System

From either node in Cluster Administrator:

1. Right-click **QSSERVER**.
2. Select **Bring Online**.

To restart QS System after a power loss

If all drivers are off:

1. Power up **SAN** and wait two minutes
2. Power up **Node 1** and wait one minute
3. Power up **Node 2**.
4. Check that cluster is online using the **Cluster Administrator**.

If all devices are on but cluster admin has a red X for D:

1. Shut down **Node 2**.
2. Reboot **Node 1**.
3. Use **Cluster Administrator** to verify that the cluster has started.
4. If cluster has started, power up **Node 2**. If cluster has not started, call Technical Support.

Chapter 8: Disaster Recovery

The process of disaster recovery cannot happen without some preparation up front. This chapter describes the requirements for disaster recovery, as well as how to set up the environment for disaster recovery and then how to recover from a disaster.

What do you want to learn about?

Environment and Assumptions (page 139)

Setting up the Disaster Recovery Environment (page 142)

Recovering from a Disaster (page 143)

Known Deficiencies (page 143)

Miscellaneous Information (page 144)

Environment and Assumptions

Before you can set up the ability to recover from a disaster, you need to be sure that your environment meets the requirements for the process. You also need to be aware of several assumptions about your environment for this process to be successful.

What do you want to learn about?

Disaster Recovery Staging Drive (K:) (page 139)

Hardware and Software Requirements (page 141)

Disaster Recovery Staging Drive (K:)

To provide seamless backup capabilities, a staging drive must be created. The drive letter K was chosen because it interferes least with various shipping configurations including Microsoft Windows 2000 and Microsoft Windows 2003. There is nothing to prevent a site from changing the staging drive letter to another letter as long as it does not conflict with other QS drive letters.

The staging drive will hold data from PFILS (patient data), MSACCESS (audit data), SITE (customer specific clinical content), and ARCHIVE (archive data) compiled at various intervals. These directories are copied from the QS Root directory or as specified by the PFILPATH and CDATPATH environment variables.

Guidelines for the staging drive

The preferred configuration for the staging drive is to be on its own partition on its own physical drive and on its own drive controller. While it may use various RAID schemes, there is no compelling reason to use mirroring as the staging drive itself is a copy of the current data that will constantly be overwritten and kept up to date.

Size requirements for the staging drive

The current size requirements for the QS drive (D: drive) are 10 GB for Microsoft Windows 2000 and Microsoft Windows 2003 and Microsoft Windows NT. The staging drive has the same requirement of 10 GB.

Cluster server requirements for the staging drive

The cluster servers are shipped with a RAID array that includes the D: drive (for QS) and Q: drive (the Quorum drive for clustering). It is preferred if the staging drive is configured as part of this RAID array.

The current shipping array consists of 4 physical hard drives each 36.4 GB in size under one Smart Array Cluster Controller. One physical drive is configured as a hot spare, and the other three are configured as RAID-5 and logically partitioned into two drives, D and Q. RAID-5 on 3 drives will lose 33% of the available space to parity, thus, about 70 GB remain as usable space. 500 MB is allocated as the Quorum drive and the rest is used as the QS drive.

The possible configurations for the staging drive are as follows:

- In the recommended configuration, an additional physical drive is added to the array, preferably in a SAN. When configured as RAID-5 on 4 drives, 25% of the available space will be lost to parity and usable space will be around 105 GB. With 3 logical partitions, 500 MB will still have to be used as the Quorum drive, 10 GB used as the Staging drive, and the rest (94.5 GB) can be used as the QS drive.
- If an additional physical drive cannot be added to the array, partition the 70 GB of usable space into 3 logical partitions where 500 MB is allocated as the Quorum drive, 10 GB is allocated as the Staging drive, and the rest (59.5 GB) as the QS drive.
- A less desirable configuration is to partition the C: drive and make room for the staging drive. This is less desired because the C: drive is mirrored and performance will suffer on constant writes to the C: drive, which is optimized for reads. It is important to make the staging drive partition on both nodes on the C: drive for this configuration to work.
- An even less desirable configuration for sites that already have servers deployed and existing data on them is to map a shared folder to a staging drive. The reason this option is suggested last is that utilities that can partition existing drives without destroying or overwriting data are often expensive.

Single server requirements for the staging drive

The single server currently ships with two logical drive partitions, C: and D: for QS. The possible configurations for the staging drive (K:) is as follows:

- In the best case scenario, an additional physical drive will be added and 3 logical drives will be configured as C, D, and K.

- If an additional physical drive cannot be added, logically partition the existing physical drives to create 3 logical drives C, D, and K.
- A less desirable configuration for sites that already have servers deployed and existing data on them is to map a shared folder to the staging drive. Like the cluster server, this is only suggested if no other options are available.

Hardware and Software Requirements

Networking Requirements

In sites where any server is used as the PMS acquire server, the network latency must not exceed 10 milliseconds ping time from the server to the concentrator devices such as the Equinox devices. In addition, latency times should be less than 10 milliseconds with a 1500 byte packet between all QS hardware.

NOTE: If the same network is used for application and backup/restore traffic, network saturation could occur and affect application response times due to latency induced by a lack of bandwidth.

The following assumptions

Assuming a 100 MB network running at full duplex, ping times should be less than 20 milliseconds from server to workstation in a LAN environment using 64 KB packets.

Also assuming a 100 MB network running at full duplex, ping times should be less than 120 milliseconds from PMS server to Equinox in a LAN environment using 50000 byte packets. The Equinox ping times are lower due to its limited 100/half duplex ability.

It will be safe to require the 10 milliseconds ping time. The above info is given as a guide.

Digi devices

Since Digi devices are serial devices, they fall under the RS422 cabling requirements. Digi also has a 1500 ft. cabling limit unless a signal booster is used. They also have a RS422 fibre adapter option.

Secondary Storage Requirements

This is supplied by the customer and usually will come in the form of a SAN or a NAS. In the case of a SAN, a drive letter will already have been mapped to the server, thus, that drive letter can be used to set the secondary storage device. In the case of a NAS, the customer is responsible for providing a mapped drive letter to the QS server. This drive letter will be used to set the secondary storage device.

Setting up the Disaster Recovery Environment

Once you know that your equipment can handle the disaster recovery requirements, you are ready to set up the disaster recovery environment.

NOTE: There is some work that the QSIC completes during the installation of the QS system. If you are adding the disaster recovery option to an existing site, you must call technical support and have this work completed first.

Customer-Responsible Items

Secondary Storage Drive

The customer or its IT department is responsible for the setup of the secondary storage device.

In the case of a SAN or a NAS, the QS system requires a mapped drive letter and associated permissions to read and write to the device.

Staging Drive

The customer or its IT department is responsible for the setup of the Staging Drive device. In the case of a SAN or a NAS, the QS system requires a mapped drive letter and associated permissions to read and write to the device.

Backup Interval

After obtaining the desired disaster recovery backup interval from the customer, GE can set the time interval sin the TPL file.

The absolute minimum interval is 20 minutes for a moderately loaded Xeon 2.8 GHz or Pentium-4 3.2 GHz machine. For machines slower or more heavily loaded, the minimum interval should be 40 minutes. Typically, 1 to 12 hour intervals should work.

The minimum interval for PFILS is 15 minutes. However, this is typically set higher.

Data Purging on the Secondary Storage Device

Make sure that the secondary storage device will run out of space if not cleaned up. How soon this will happen is dependent on several factors, such as the following: What is the capacity of the device? How often is data backed up (time interval)? How large is the data?

The customer’s IT department must periodically purge old data. GE will not assume any responsibility for this action.

Recovering from a Disaster

The disaster recovery is not meant to be a failover server. It is designed to be a temporary server so that the customer can get back online as quickly as possible. For information on the failover server, see:

- System Failover (page 135)
- Backup Server (page 143)
- Replacement Server (page 143)

Backup Server

If a backup server is available, follow the procedure for making a backup server into a primary server. Afterwards, the process is the same as the replacement server. For information on making a backup server a primary server, see “System Failover” on page 135.

Replacement Server

When the replacement server arrives, install QS as would normally be done. In most cases, this will be using the InstallShield on the CD. Then copy the contents of the four key directories; PFILS, SITE, ARCHIVE, MSACCESS to the newly set up server. Bring QS up and verify that the customer is back up again.

Known Deficiencies

Country Code

The date appended in the directory name only works for the US (country code 001). However, this code can be tailored to the country in which it will be used. The code can be found in the batch file QS2ndStore.BAT.

WAN Distance

This is driven by time zone. The QS system is not currently capable of having two sites running the application in two separate time zones.

Node separation of Clusters using Fibre

GE currently does not sell clusters with separated nodes using fibre HBAs for SAN connectivity and data storage. There is a private cluster network latency requirement of 500 ms or less. In addition, the 10 ms latency requirement must be met.

Miscellaneous Information

Size requirements for various Drives

The following information has been obtained as a rule of thumb and is provided as a reference. Be aware that it may not be the most current information.

- D: drive on Microsoft Windows NT should be at least 2 GB.
- D: drive on Microsoft Windows 2000 and Microsoft Windows 2003 should be at least 10 GB.
- A large customer database is 90 MB per copy.
- Default setting for customer database is 10 MB.
- Average PFILS size is 100 KB per patient.
- Birthlog is typically 5-15 MB. They keep growing and potentially could pass the 2 GB limit of Microsoft Access.
- HIPAA logs might reach several hundred MB in a 30 day period.

Geographical separation

There will be no restriction on LAN, WAN, or VLAN as long as the 10 ms ping time requirement can be met. The geographical separation will be limited to this 10 ms latency.

Appendix A: Glossary of Network Terms

100BaseFX—100Mbps Ethernet (Fast Ethernet) running on multimedia fiber media.

100BaseTX—100Mbps Ethernet (Fast Ethernet) running on CAT6 UTP media.

10BaseFL—10Mbps Ethernet running on multi-mode fiber media.

10BaseT—10Mbps Ethernet running on CAT6 UTP media.

Asynchronous Transfer Mode (ATM)—A high-speed transmission protocol where data blocks are broken into small cells which are transmitted individually and possibly via different routes.

Attenuation—A weakening of a signal as a result of distance and characteristics of the medium.

Backbone—Connects two or more networks.

Bandwidth—A measure of the amount of data that can be transmitted over a period of time.

Bits-Per-Second (bps)—The number of bits that can be transmitted over a medium in one second. A measure of data transmission speed.

Bridge—An interface used to connect networks using similar data link protocols.

Broadcast—A message sent to all users on a network.

Carrier Sense with Multiple Access and Collision Detection (CSMA/CD)—The media access control technique used by Ethernet that attempts to detect collisions.

Category 6 (CAT6) Unshielded Twisted Pair (UTP) Cable—Copper-based cable used for network infrastructure. Required for Fast Ethernet.

Client—A software application that requests services from the server in a client/server computing environment.

Client/Server—An application framework in which the processing load is divided among several processes call clients and servers. Clients issue requests to servers which provide specialized services such as database processing. When clients and servers are located in different computers, application processing is distributed over multiple computers and, in effect, the network becomes the computer.

Collision—Occurs when two stations attempt to send data at the same time. The data interferes with each other and re-transmission is necessary.

Dedicated Server—One or more computers that operate only as a designated file, database, or other type of server.

Ethernet—A local area network implementation using the CSMA/CD protocol. The IEEE 802.3 is based on Ethernet and is one of the more popular local area network implementations. Data is transmitted at 10Mbps.

Fast Ethernet—A local area network implementation nearly identical to Ethernet but running at 100Mbps.

Fiber Distributed Data Interface (FDDI)—An ANSI LAN standard for fiber optic LANs spanning a distance of approximately 200km (120mi.) and providing speeds of 100Mbps.

-

Fiber Optic Cable—A transmission medium that provides high data rates and low errors. Plastic or glass fibers are woven together to form the core of the cable. This core is surrounded by a plastic or glass layer called the cladding. The cladding in turn is covered by a protective plastic covering.

File Server—A computer that allows other computers on a network to share resources such as data, programs, and printers.

Fractional T1—A T1 service that fills the void of high speed options between 64Kbps and 1.5Mbps by providing a portion of a T1 line to a customer.

Full Duplex—A data transmission mode in which data is transmitted over a link in both directions simultaneously.

Gateway—The interface used to connect two dissimilar networks or systems by providing conversion from one network to another.

Half Duplex—A data transmission mode in which data can travel in both directions over a link but in only one direction at a time.

House Network—An existing, corporate-use network.

Hub—The connection point of all clients and servers. A piece of network equipment used in virtually all networks.

Integrated Services Digital Network (ISDN)—The integration of voice and data transmission (and other formats such as video and graphics images) over a digital transmission network. Combination of two B channels allows for data transmissions of up to 128Kbps.

Local Area Network (LAN)—A communications network in which all the components are located within several kilometers of each other and that uses high transmission speeds.

Media Access Control (MAC) protocol—A sub layer of the OSI reference model's data link layer. The MAC protocol defines how a station gains access to the media for data transmission. Ethernet's MAC is CSMA/CD.

Medium—In data communications, the carrier of data signals. Twisted pair wires, coaxial cables, and fiber optic cables are the most common LAN media.

Multi-mode Fiber—Fiber optic cable which can accept several wavelengths of light as its source of propagation.

Network Topology—A model for the way in which network nodes are connected. Network topologies include star, ring, and bus.

Redundant Arrays of Inexpensive Drives (RAID)—A fault-tolerant disk storage technique that spreads one file plus the file's checksum information over several disk drives. If any single disk drive fails, the data stored on it can be reconstructed from data stored on the remaining drives.

Router—A network interconnection device and associated software that links two networks. The networks being linked can be different, but they must use a common routing protocol.

Switch—Network component designed to increase network performance by facilitating LAN segmentation.

Synchronous Optical Network (SONET)—An optical-based network which standardizes transmission speeds and encoding, allowing multiple transmission formats to be sent on one line at a rate of 51.85Mbps.

-

T1—A leased digital transmission link with a bandwidth of 1.544Mbps

T2—A leased digital transmission link with a bandwidth of 6.312Mbps

T3—A leased digital transmission link with a bandwidth of 44.736Mbps

T4—A leased digital transmission link with a bandwidth of 274.176Mbps

Token Ring—A network type based upon a token passing media access control protocol. A "token" is passed amongst the network nodes. When a computer which has data to transmit receives the token, it may transmit that data. Upon transmission, the token is passed to the next node in the ring.

Transceiver—A device containing transmit and receive electronics which allows connection of differing transmission media (10Base2 and AUI, and so forth).

Transmission Control Protocol/Internet Protocol (TCP/IP)—A suite of internetwork protocols developed by the U.S. Department of Defense for internetwork file transfers, electronic mail transfer, remote logons, and terminal services.

Uninterruptible Power Supply (UPS)—A backup power unit that continues to provide power to a computer system during the failure of the normal power supply. A UPS is frequently used to protect LAN servers from power failures.

Virtual LAN (VLAN)—Logically grouped network elements. VLANs are a successful way of modifying the amount of traffic in any given sub-net.

Wide Area Network (WAN)—A network that typically covers a wide geographical area and operates at speeds generally lower than those of a LAN.

Appendix B: Sample Network Diagrams

The following pages illustrate a variety of possible QS network configurations. Note that this collection of diagrams represents but a small number of the network configurations that are possible in the QS. If you have questions about what constitutes the best configuration for a specific situation, please contact your GE Customer Support representative.

What diagram would you like to see?

- HL7 Solar Lab Access Configuration (page 150)
- Intensive Care Configuration - Single Unit (page 151)
- Intensive Care Configuration - Multiple Units (page 152)
- Surveillance Configuration - Single Unit (page 153)
- Surveillance Configuration with Equinox Concentrator - Multiple Units (page 154)
- Surveillance Configuration - Wide Area Network (WAN) (page 155)
- Surveillance Configuration (WAN) - Primary & Remote Sites (page 156)
- Surveillance Configuration WAN-Ring (page 157)

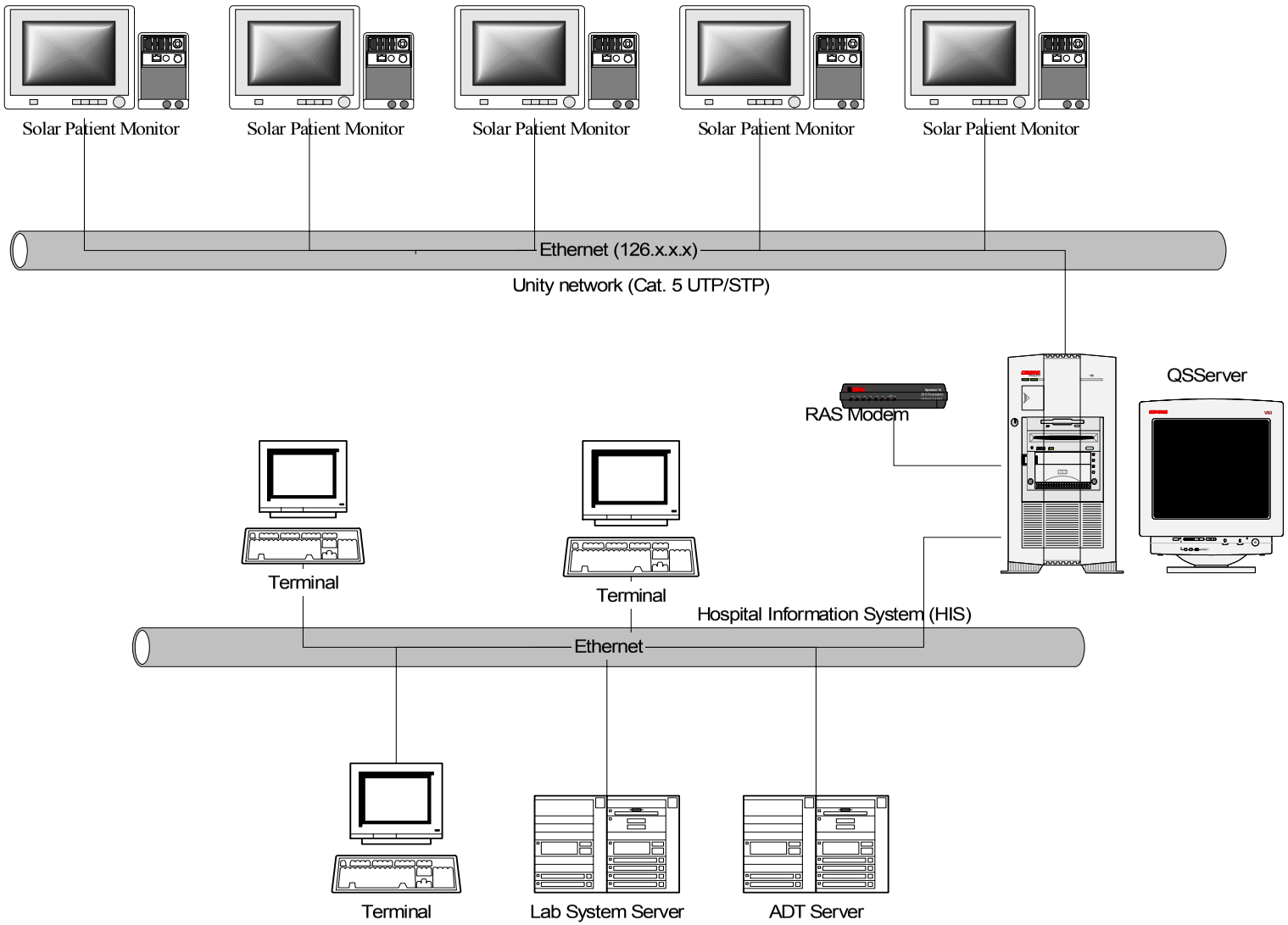


Figure B-1: HL7 Solar Lab Access Configuration

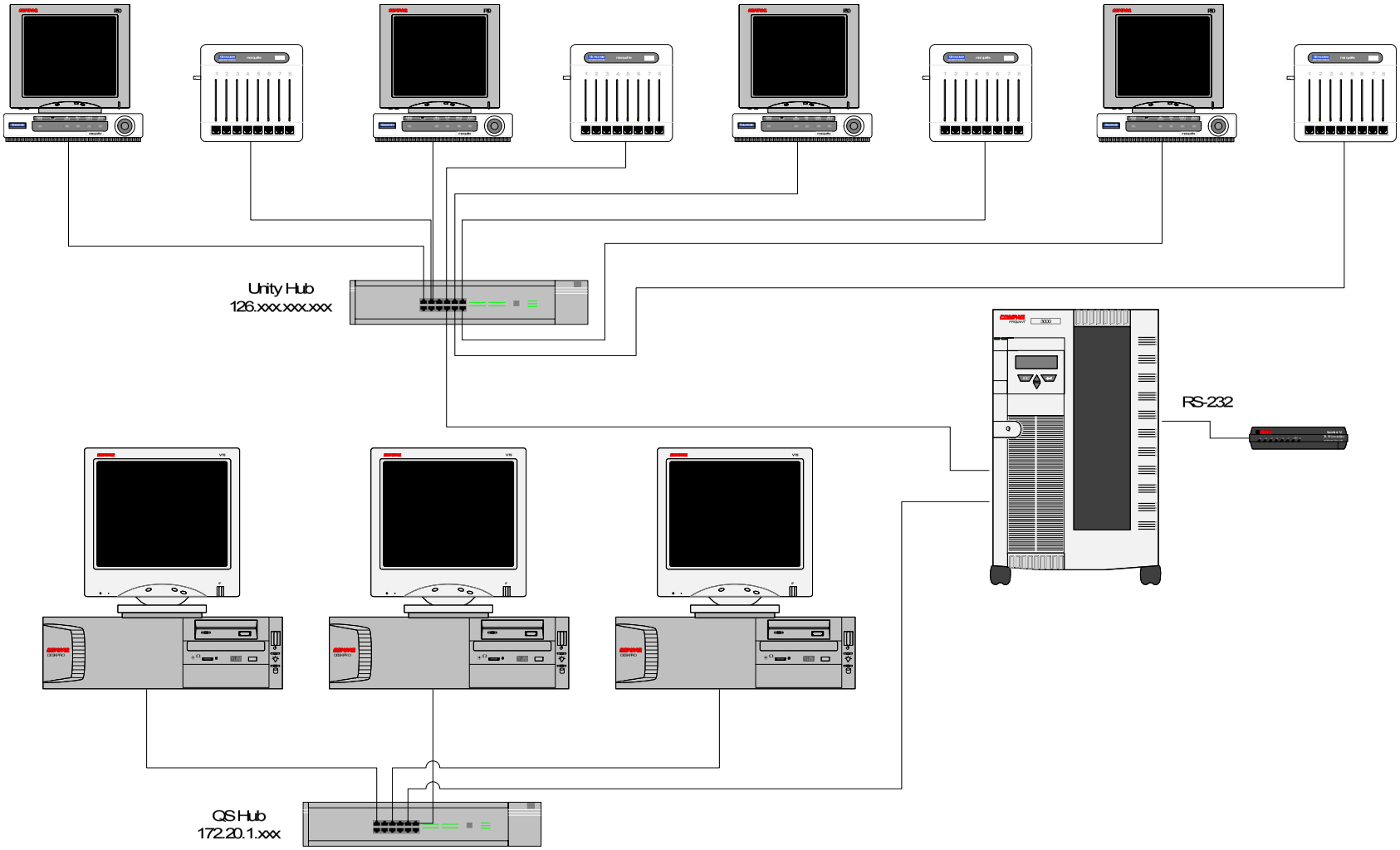


Figure B-2: Intensive Care Configuration - Single Unit

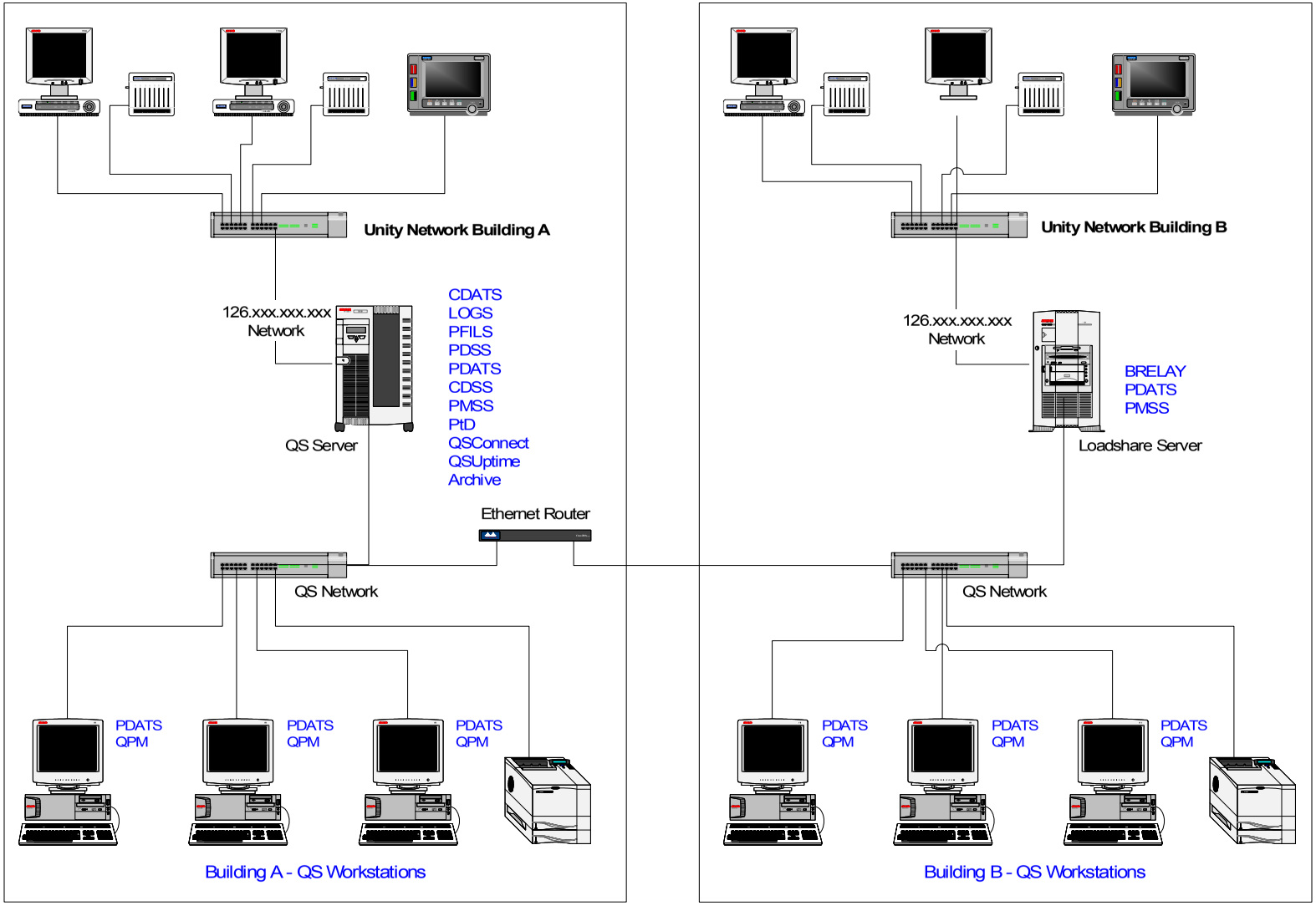


Figure B-3: Intensive Care Configuration - Multiple Units

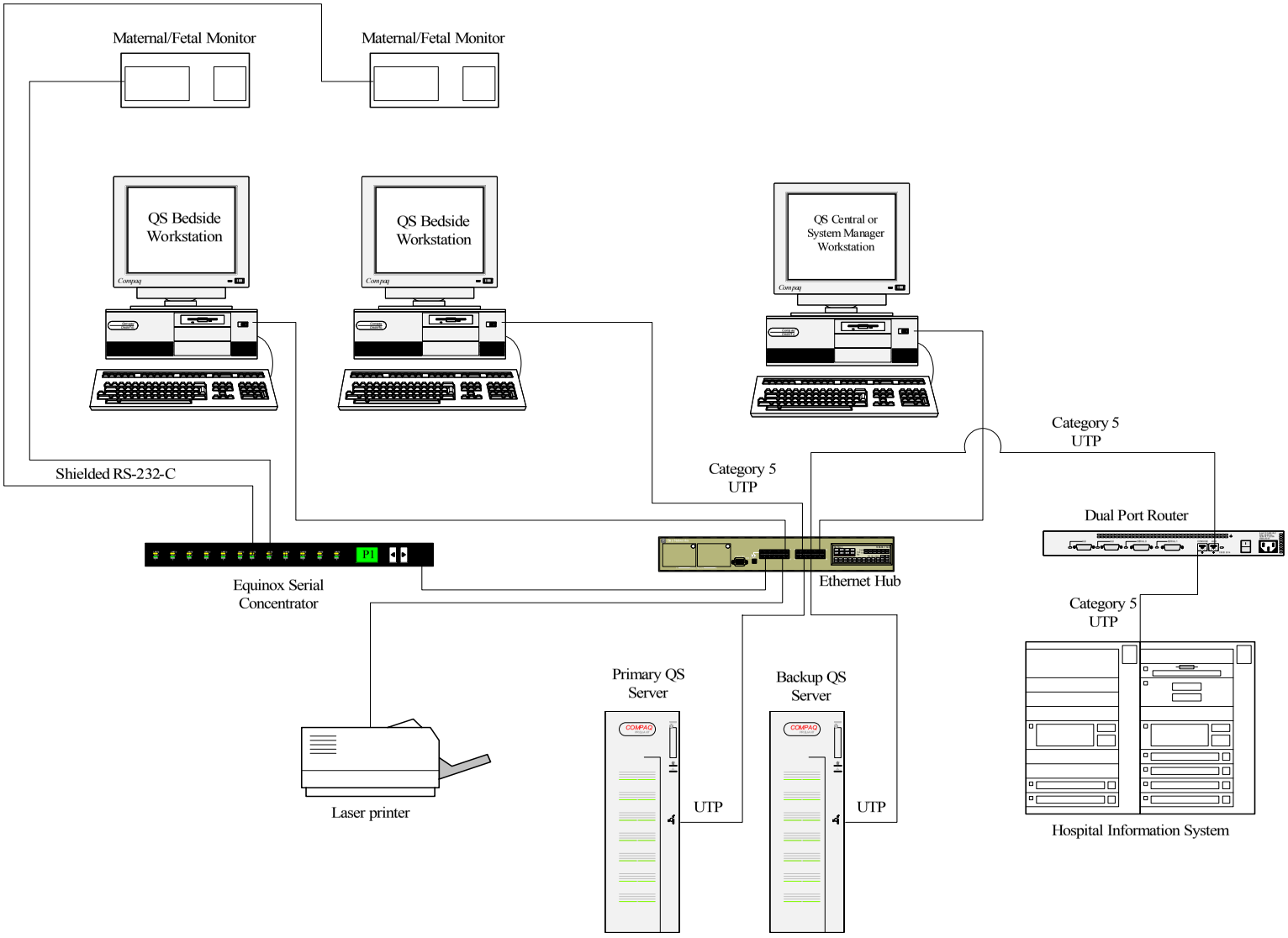


Figure B-4: Surveillance Configuration - Single Unit

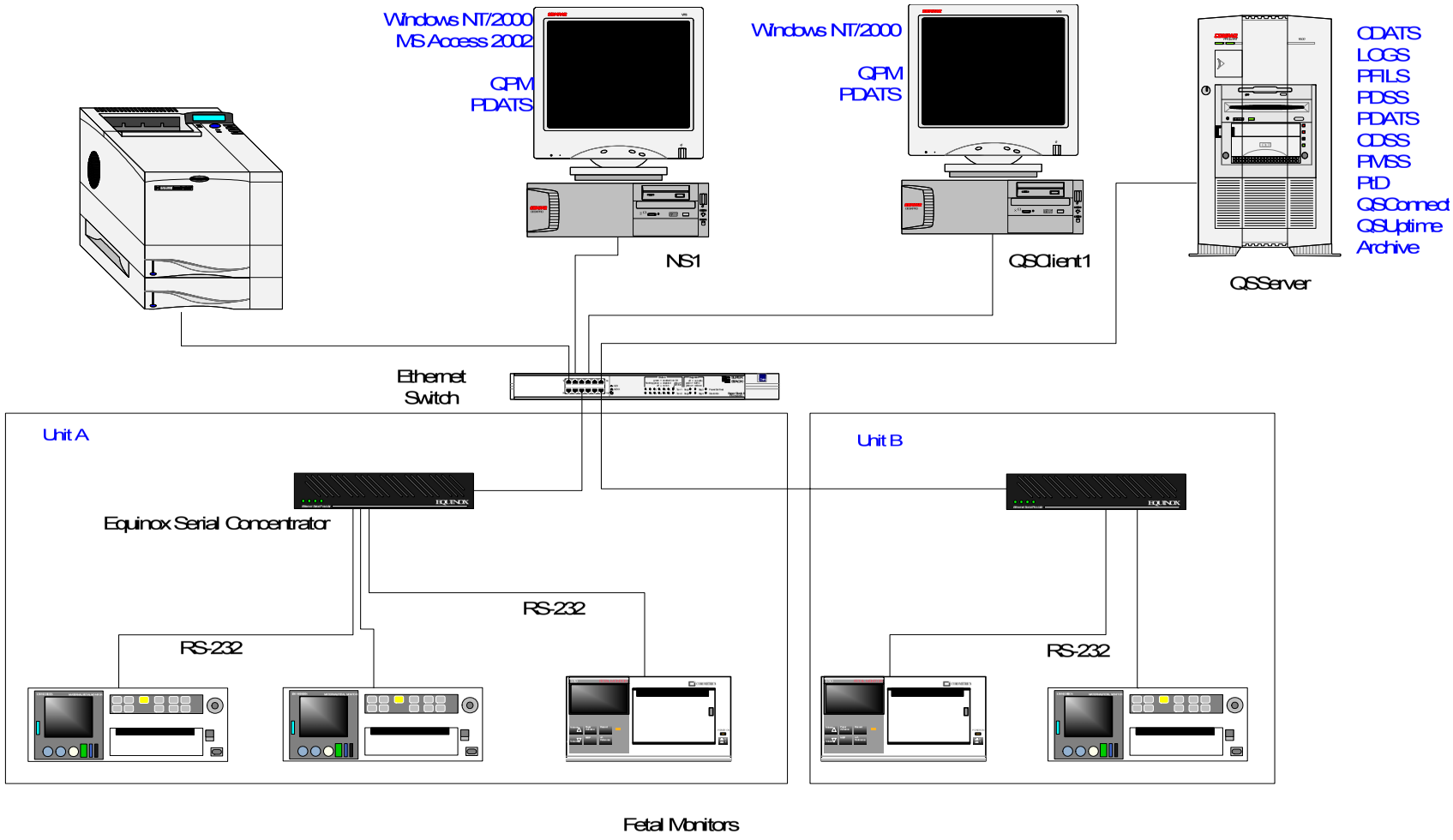


Figure B-5: Surveillance Configuration with Equinox Concentrator - Multiple Units

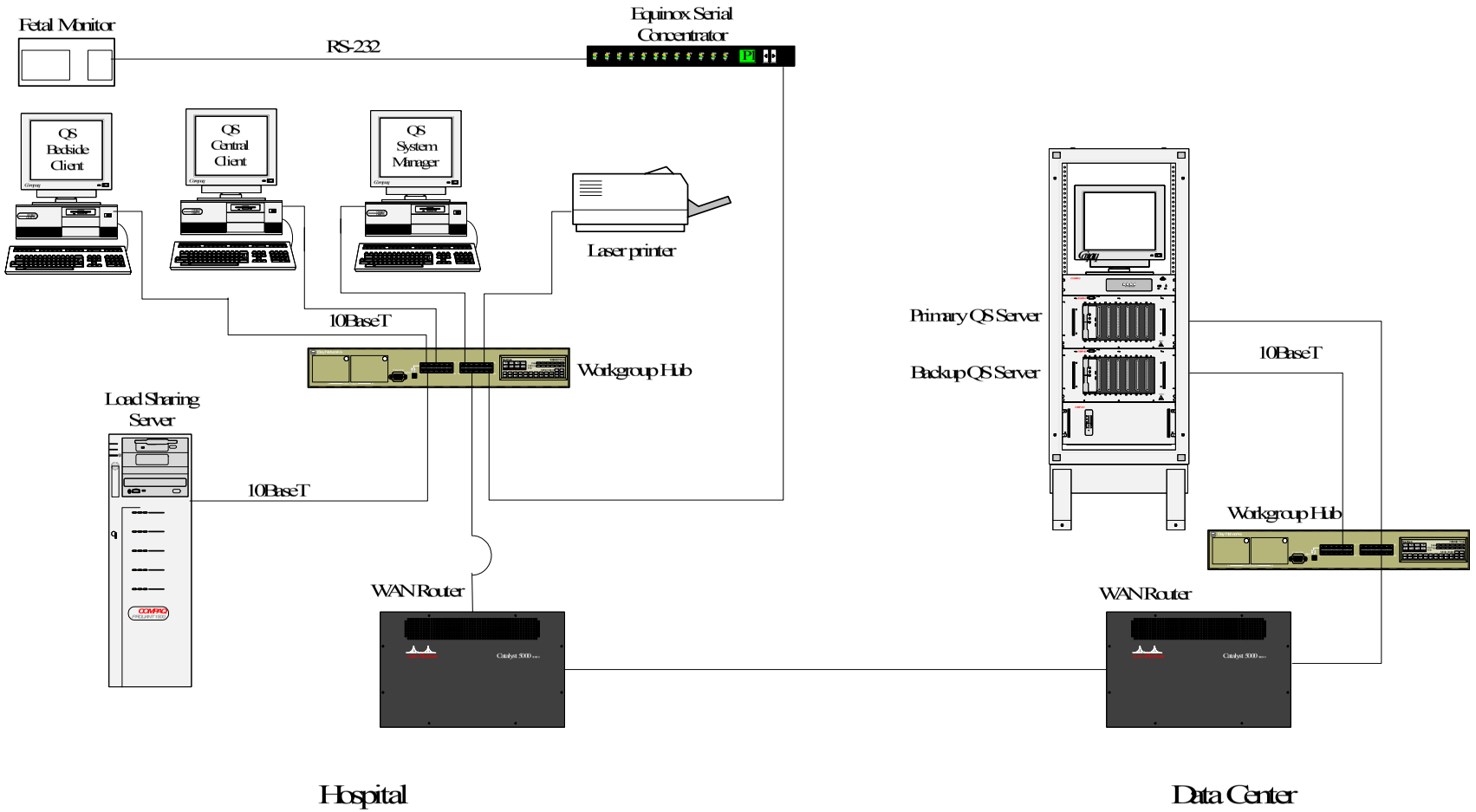


Figure B-6: Surveillance Configuration - Wide Area Network (WAN)

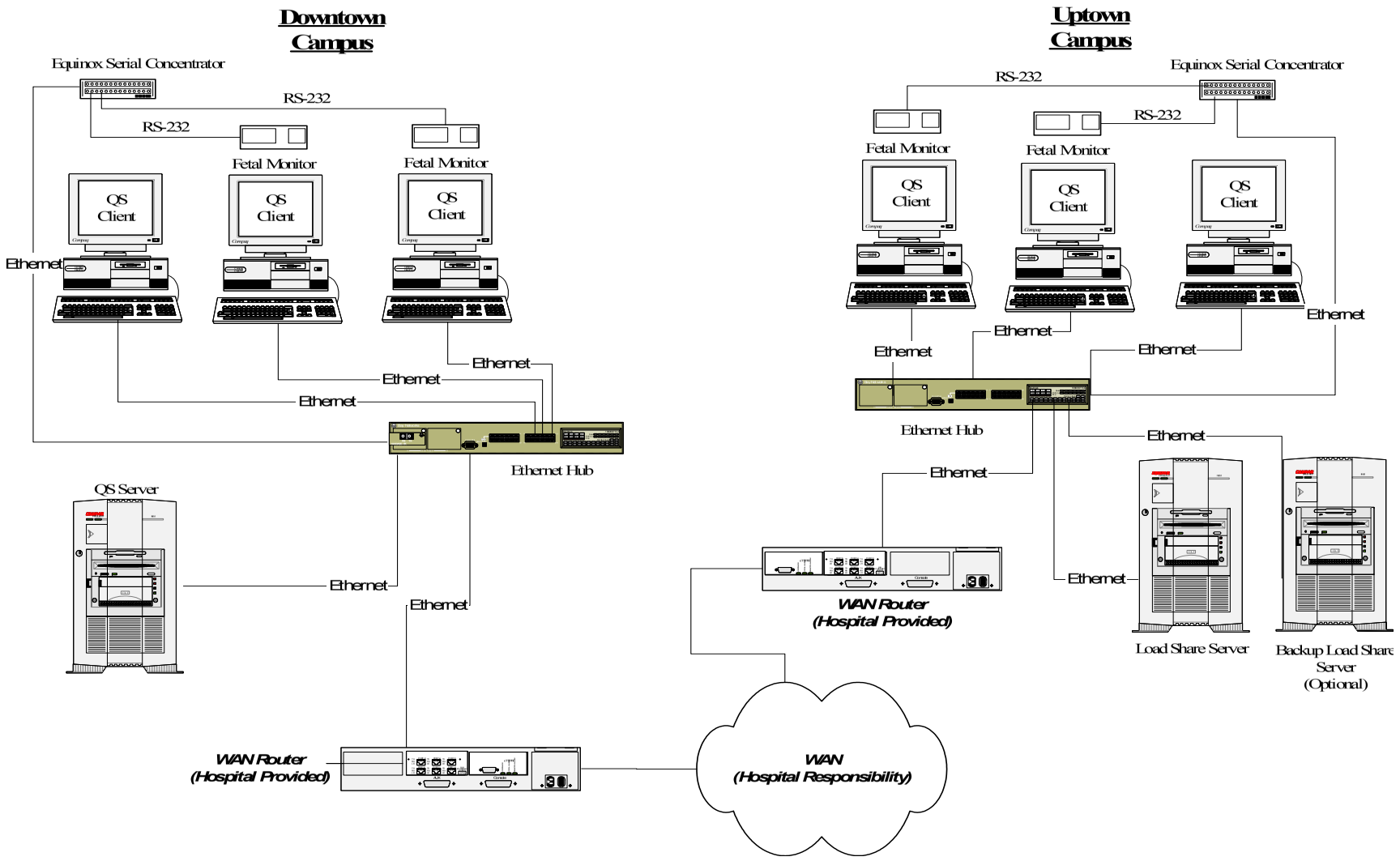


Figure B-7: Surveillance Configuration (WAN) - Primary & Remote Sites

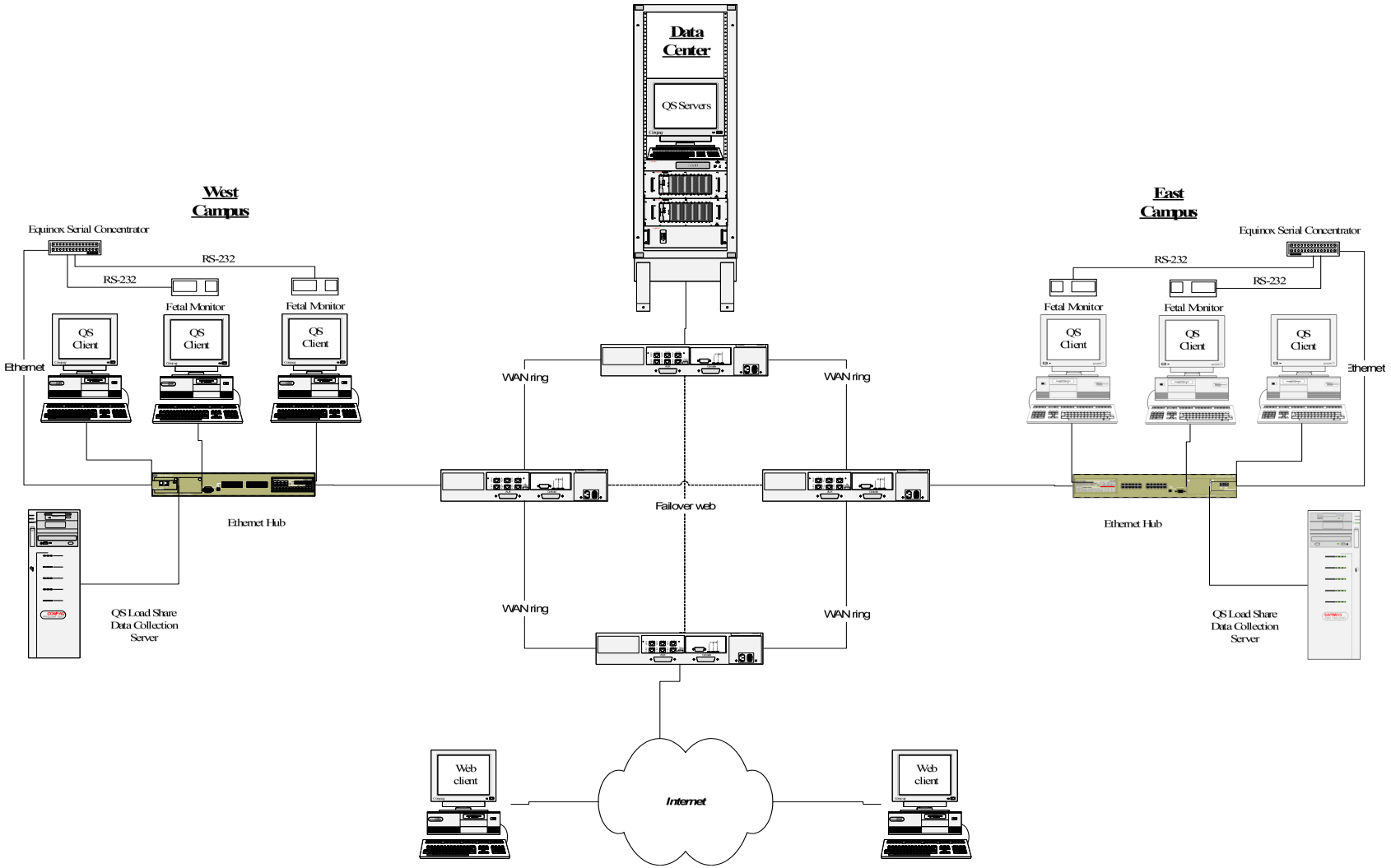


Figure B-8: Surveillance Configuration WAN-Ring

Appendix C: Fetal Monitor Set-Up

The following pages contain information necessary for interfacing fetal monitors with the QS.

Which monitor do you want to learn about?

- Corometrics® 115 (page 159)
- Corometrics® 116 (page 161)
- Corometrics® 118 (page 163)
- Corometrics® 120 Series (page 164)
- Corometrics® 145 (page 164)
- Corometrics® 150 (page 164)
- Corometrics® 151 (page 165)
- Corometrics® 170 Series (page 166)
- Hewlett Packard/Philips Series 50 (1350, 1351, 1353) (page 167)
- Hewlett Packard 8040 (page 168)
- Hewlett Packard 8041 (page 168)
- Spacelabs MOM™ model 94000 (page 168)

Corometrics® 115

The information within Table 1, Table 2, and Table 3 reflect the switch settings for the Corometrics® 115 fetal monitor.

Table 1: Corometrics 115 Dip Switch Settings - Switch SW1

Monitor I.D. For RS-232		
Switch #	**Position**	**Status**
1	OFF	Default[a]
2	OFF	Default[a]
3	OFF	Default[a]
4	OFF	Default[a]
5	OFF	Default[a]
Communication Mode		
Switch #	**Position**	**Status**

Table 1: Corometrics 115 Dip Switch Settings - Switch SW1

Monitor I.D. For RS-232		
6	ON	Request[a]
	OFF	Update
7	ON	No Parity[a]
	OFF	Parity
8	ON	Odd Parity
	OFF	Even Parity

a. required setting for the serial configuration

Table 2: Corometrics 115 Dip Switch Settings - Switch SW2

RS-232 Speed					
Switch #	**9600 bps**	**4800 bps**	**2400 bps**	**1200 bps**	**300 bps**
1	ON	OFF	ON[a]	OFF	ON
2	ON	ON	OFF[a]	OFF	ON
3	ON	ON	ON[a]	ON	OFF

a. Required setting for the serial configuration.

Table 3: Corometrics 115 Dip Switch Settings - Switch SW3

Language					
Switch #	**English**	**French[a]**	**German[a]**	**Spanish[b]**	**Japanese[c]**
1	ON[d]	OFF	ON	OFF	ON
2	ON[d]	ON	OFF	OFF	ON
3	ON[d]	ON	ON	ON	OFF
Communication Options					
Switch #	**No Communica-tions**	**RS-232**	**Corolan**	**Undefined**	
4	ON	OFF[d]	ON	OFF	
5	ON	ON[d]	OFF	OFF	
Chart Settings					
Switch #	**Feature**	**Position**	**Status**		
6	CHART SPEED	ON	1-2cm/min.		

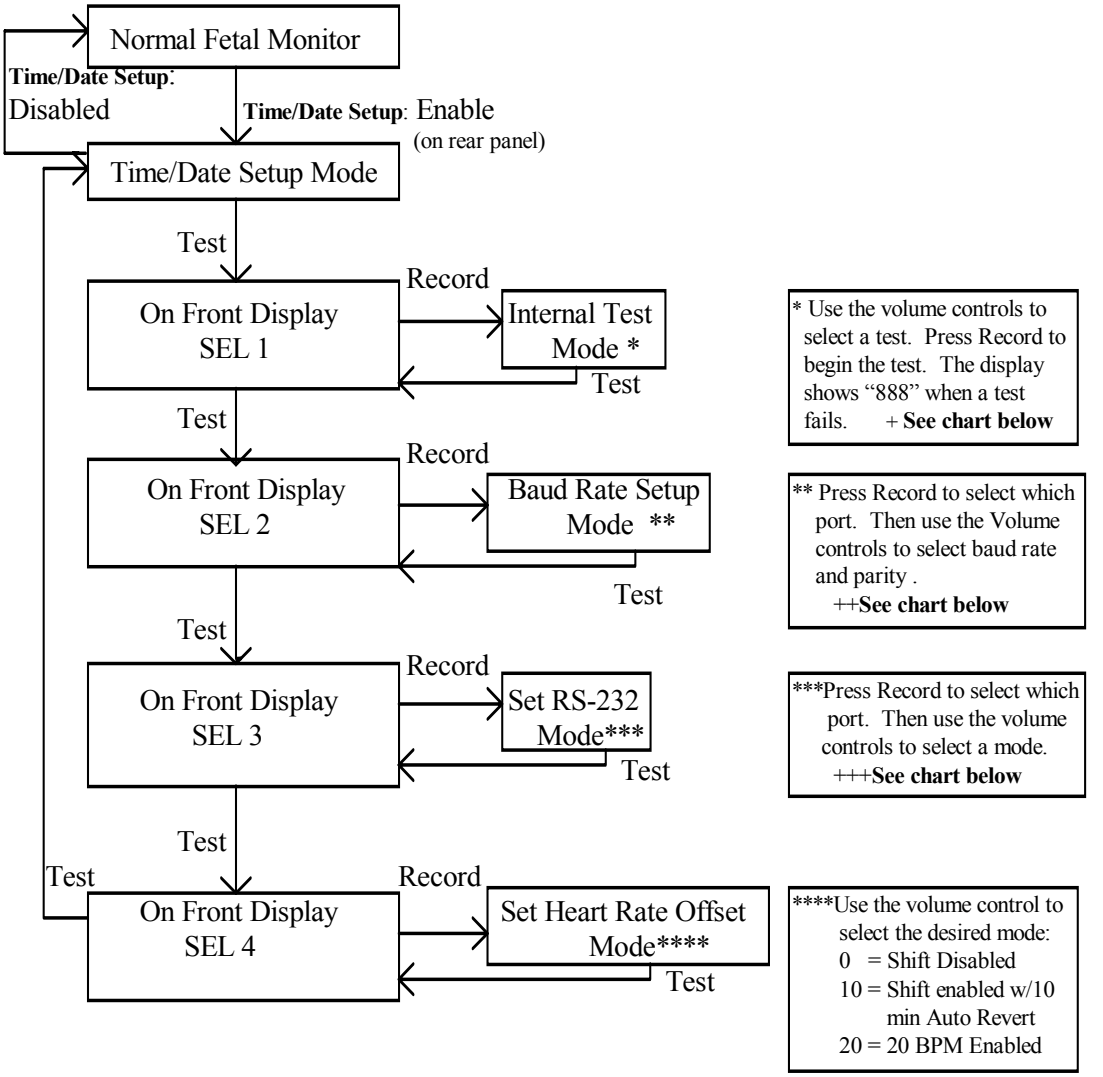
Language			
		OFF[d]	1-3cm/min.
7	CHART SCALE	ON[d]	30-240 BPM
		OFF	50-210BPM

a. For Single Cardiotach - valid only for 50-210 chart scale.
b. For Dual Cardiotach only.
c. For Single Cardiotach - valid only for 30-240 chart scale.
d. Required setting for the serial configuration.

Corometrics® 116

The 116 requires that the baud rate be set at 9600, and the parity be set to NONE in the SEL2 setup screen and the RS-232 mode must be set for 1 (115 TX/RX) in the SEL3 screen.

Use Figure C-1 to aid you in configuring the Corometrics® 116 fetal monitor.



+Internal Test Mode

Test	Function
1	CPU CRC ROM Check
2	Recorder dots check
3	1.2V J102 check
4	1.2V ramp
5	Absolute UA
6	J102 mode lines
7	Dip switch settings
8	Comm., need loopback
9	Strobe with timer
10	Print error log
11	Erase error log

++Baud Rate Setup Mode

Display 1	Baud Rate	Display 2	Parity	Display 3	Port
3	300	0	None	110	J110
6	600	1	Odd	109	J109
12	1200	2	Even		
24	2400				
48	4800				
96	9600				

+++Set RS-232 Mode

Display 1	Mode
0	115 Update
1	115 Tx/Rx
2	ASCII IN
3	Spectra- Tel
4	556, Critikon, Colin
5	555, Nellcor, Ohmeda
6	Datascope
Display 3	**Port**
110	J110
109	J109

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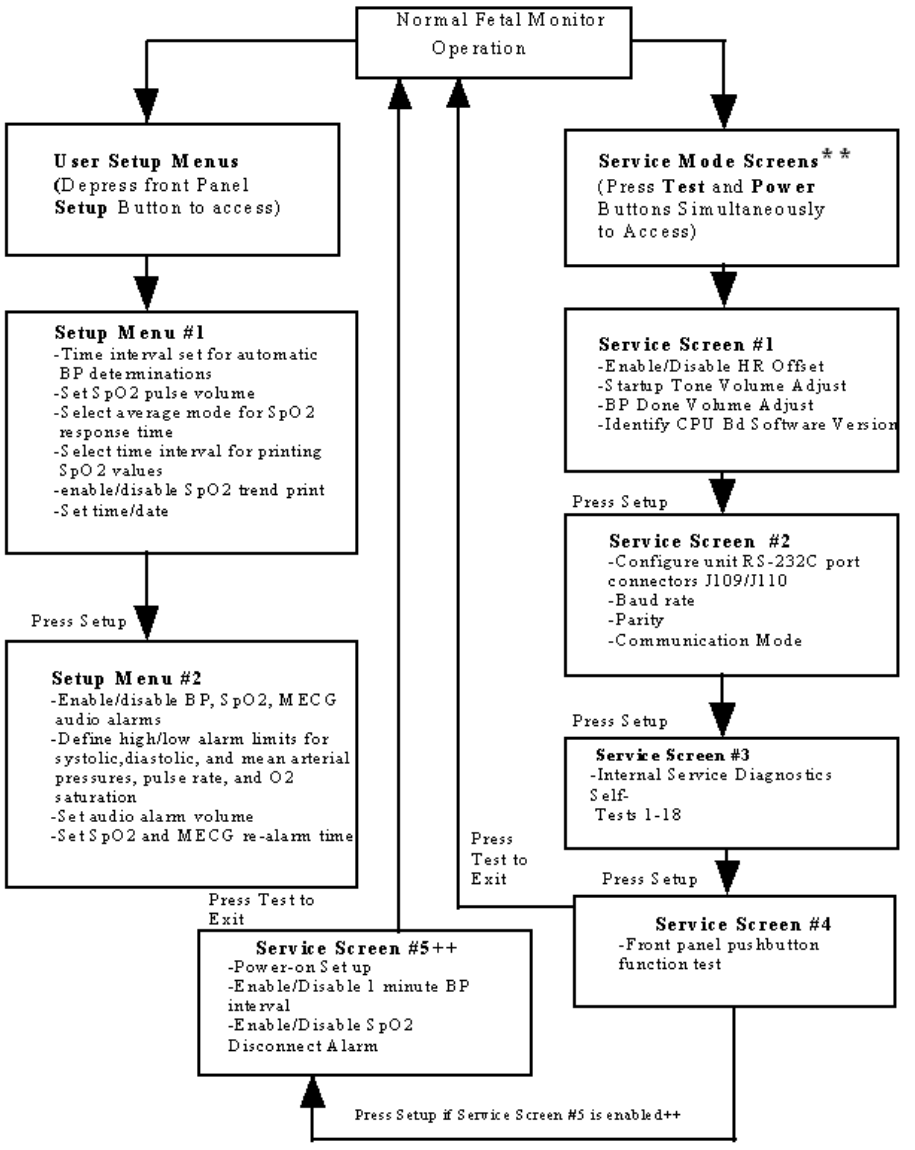
Figure C-1: Corometrics® 116 Set-up

Corometrics® 118

The Corometrics® 118 requires the baud rate to be 9600, parity set to NONE, and the communication mode set to 115 Transmit/ Receive. This will all be set in the Service Screen mode, service screen #2. Use Figure C-2 to aid you in this configuration.


Normal Fetal Monitor Operation
User Setup Menus
(Depress front Panel Setup Button to access)
Setup Menu #1
-Time interval set for automatic BP determinations
-Set SpO2 pulse volume
-Select average mode for SpO2 response time
-Select time interval for printing SpO2 values
-enable/disable SpO2 trend print
-Set time/date
Press Setup
Setup Menu #2
-Enable/disable BP, SpO2, MECG audio alarms
-Define high/low alarm limits for systolic,diastolic, and mean arterial pressures, pulse rate, and O2 saturation
-Set audio alarm volume
-Set SpO2 and MECG re-alarm time
Press Test to Exit
Service Screen #5++
-Power-on Set up
-Enable/Disable 1 minute BP interval
-Enable/Disable SpO2 Disconnect Alarm
Service Mode**
(Press Test and Power Buttons Simultaneously to Access)
Service Screen #1
-Enable/Disable HR Offset
-Startup Tone Volume Adjust
-BP Done Volume Adjust
-Identify CPU Bd Software Version
Press Setup
Service Screen #2
-Configure unit RS-232C port connectors J109/J110
-Baud rate
-Parity
-Communication Mode
Press Setup
Service Screen #3
-Internal Service Diagnostics Self-Tests 1-18
Press Test to Exit
Press Setup
Service Screen #4
-Front panel pushbutton function test
Press Setup if Service Screen #5 is enabled++

Service Mode**	
SW1-2	Front Panel Setup
Off	Unlock
On	Locked

Service Screen #5-Peripheral Board Switch Settings ++

SERVICE SCREEN #5	SW2 5	SW2 6	SW2 7	SW2 8
ENABLED (Defaults selected via Service Mode	OFF	ON	OFF	ON
DISABLED (Factory defaults only)	ANY OTHER SETTING			

Figure C-2: Corometrics® 118 Set-up

Corometrics® 120 Series

1. Power up the fetal monitor and highlight **Setup** on the main screen by turning the trim knob.
2. Press the trim knob.
3. Highlight **Service** on the **General Setup** screen by turning trim knob.
4. Press the trim knob.
5. Enter 4-digit access code (day and month)—for example, **3111** represents November 31st.
6. Click on last digit of access code (pressing the trim knob).

   You enter the **Service** screen. If the access code does not work, try switching the day and month values.
7. Highlight **Comm** on the **Service** screen.
8. Press the trim knob.
9. Highlight the **baud rate** for the port you are configuring by turning the trim knob to cycle through available settings until the desired baud rate (**1200**) is highlighted.
10. Press the trim knob.
11. Highlight the **mode** for the port you are configuring by turning the trim knob to cycle through available settings until the desired mode (**1371**) is highlighted.
12. Press the trim knob.
13. Return to the main screen.
14. Switch the monitor **OFF** and then back **ON**.

The selected 1371 protocol “Specified” be used with the “Not Specified” and “HP Compatible” settings in the bed configuration in the QS Designer.

Corometrics® 145

An upgrade kit is required for older models without the connector labeled J102. If J102 is present an 0830AAN interface is required and no configuration of the monitor is needed.

Corometrics® 150

This monitor requires an 0830AAN interface to communicate with the serial network through the J102 port. No configuration is required for this monitor.

Corometrics® 151

On older models that only have the J102 connector an 0830AAN interface is required to communicate via the serial network. With newer units where J109 is present, use the information that follows to configure the RS-232 port for communication with the QS. The ** indicates settings for QS system

RS232 SETUP

1. Turn unit **OFF**.
2. Turn the monitor **ON** while simultaneously pressing the front panel **Volume Up** and **Down** push buttons. Continue pressing the push buttons until a **1** is displayed in the **UA** display.
3. After entry into the setup mode, press the **Volume Up** push button twice to display **3** in the UA display window.
4. Activate the **RS-232 setup mode** by pressing **Record** when the **UA** display is **3**. The **Record** LED (light emitting diode) will illuminate.
5. Press **Record** again to deactivate the **RS-232 setup mode** and dim the **Record** LED.

Configuration of the RS-232 Port

The number on the HR display indicates the type of information given on the HR2 display. The number on the HR display is sequenced with the UA Reference push button (wrapping from 3 back to 1). The Volume Up and Volume Down push buttons increment/decrement the number appearing within the HR2 display through the valid possibilities - wrapping around as appropriate. Table 4 summarizes the RS-232 port settings.

Table 4: Corometrics® 151 RS-232 Port Configuration Settings

HR DISPLAY	HR2 DISPLAY
1	MODE FOR SELECTED PORT: 0 = Critikon NIBP 1 = Model 555 NIBP 2 = Model 115 Update Mode (output) **
2	BAUD RATE OF SELECTED PORT 3 = 300 Baud 6 = 600 Baud 12 = 1200 Baud 24 = 2400 Baud **
3	PARITY OF SELECTED PORT 0 = No Parity ** 1 = Odd Parity 2 = Even Parity

Pressing the Record push button will deactivate the RS-232 setup mode and extinguish the Record LED. Pressing and releasing the Paper Advance push button will then cause the monitor to exit the setup mode and begin its normal power on self-test.

Corometrics® 170 Series

The Corometrics® 170 series monitor has two RS-232 serial connectors. By default, Port 1 is configured for connection to the QS. The settings are the same as for the 120 series: 1200 Baud, and either 1371 or 1371/notes protocol. This protocol can be used with either the HP compatible or the Not specified (auto-detect) monitor type in the Beds configuration dialog box of the QS Designer.

If the default settings have been changed, you can restore them by following the instructions below:

1. Switch the monitor off. Once the monitor is off, you can enter the service mode.
2. Press and hold the **Setup** button.
3. Press and hold the blue **Power** button.
4. Release both buttons.

   The service mode is now activated.
5. Use the **UA reference** button to toggle between the setup code (shown in the UA display) and the setting or value (shown in the primary FHR display). The UA display is active when the ± qualifier illuminates; the FHR display is active when the heartbeat indicator illuminates.
6. Use the **Volume** buttons to increase or decrease the code, value or setting shown in the active display. For the service codes, see Table 5 on page 166. For a **Model 172**, use the left-most set of volume controls.
7. After configuration, press the **Set-up** button to exit the service mode and enter the standby mode.

NOTE: If you press the power button to exit the setup mode, any changes you made will not be stored in memory. You must exit by pressing the setup button in order for the changes to take effect.

Table 5: Corometrics® 170 Series Service Codes

Code (UA display)		Setting or Value (Primary FHR Display)
Code #	**Code Description**	
22	fetal movement enable/disable	0 = off; 1 = on (if option is installed)
23	language	0 = English; 1 = Spanish; 2 = German; 3 = French; 4 = Japanese; 5 = Italian; 6 = Swedish; 7 = Dutch

Table 5: Corometrics® 170 Series Service Codes

Code (UA display)		Setting or Value (Primary FHR Display)
24	chart speed	1, 2; or 3 cm/min
25	paper scale	0 = 30-240; 1 = 50-210 (BPM)
30, 40	communications mode (port 1,2)	0 = HP; 1 = HP w/notes; 2 = ext BP; 3 = factory test
31, 41	baud rate (port1, 2)	300; 600; 1200; 2400; 4800; 9600; 19200; 38400
50	remote mark annotation style	0 = FM; 1 = arrow
51	**For Future Use** (Japanese units only)	0 = off; 1 = on
52	fetal heart rate offset enable/disable	0 = off; 1 = 10 minute auto-revert; 2 = on
53	UA reference default	5, 10, 15, 20, 25 (relative units)
100	recorder alignment	0-255

Hewlett Packard/Philips Series 50 (1350, 1351, 1353)

To support the RS-422 serial interface on the M135XA, the monitors must be at level M135XA-6801G or above on the internal firmware of the monitor. This translates to software version A.03. The software version may be determined through the following procedure.

1. Remove transducers from the monitor.
2. Press the **F** button and **Test** buttons simultaneously

   The display should read **C01**.
3. Press the **F** button until the display reads **A01**.
4. Press the **Toco baseline** key (>|<).

   The model number, serial number, and software revision level will print on the strip paper.

If it is determined that the monitor does not have version A.03 or above the M1360A upgrade needs to be ordered from Hewlett Packard. It is the hospital's responsibility to have the monitor upgraded.

An RS-422 to RS-232 converter box (part number 0835AAN) will need to be attached to these monitors.

Hewlett Packard 8040

This monitor requires an **0832AAN interface box current loop to RS-232 converter**.

NOTE: All monitors must have the system connection on the rear panel. If the connection is not there the monitor must be upgraded by HP. It is the hospital's responsibility to have the monitor upgraded.

Hewlett Packard 8041

This monitor requires an **0833AAN interface box current loop to RS-232 converter**.

NOTE: All monitors must have the system connection on the rear panel. If the connection is not there the monitor must be upgraded by HP. It is the hospital's responsibility to have the monitor upgraded.

Spacelabs MOM™ model 94000

This monitor requires the Spacelabs 012-0828-00 Rev. B interface cable or the Corometrics 1376AAO interface cable to communicate with the serial network through the J4 port. Additional information can be obtained from the Spacelabs MOM Service Manual.

Appendix D: Unity Parameters

The following pages provide parameter descriptions and the identity of the corresponding QS PMS items for the devices listed in the following paragraph. For more information on configuring Acquires, see the System section of the *Configuration Reference Manual*, part number 08046.002.QMI.

What device do you want to learn about?

- Allied Health Care Bear 1000 (page 170)
- Baxter Vigilance (page 170)
- Bird VIP (page 171)
- Datex Capnomac (page 172)
- Dräger Babylog 8000 (page 172)
- Dräger Cato (page 173)
- Dräger Evita (page 174)
- Dräger Evita 2 (page 175)
- Dräger Evita 2 Dura (page 177)
- Dräger Evita 4 (page 178)
- Dräger Julian (page 179)
- Dräger PM8060 (page 180)
- Engstrom Elsa (page 181)
- Hamilton Veolar (page 182)
- Hellige SMU EVO (page 183)
- Nellcor Puritan Bennet Adult Star 950 / 1500 / 2000 (page 184)
- Nellcor Puritan Bennet Infant Star (page 185)
- Nellcor Puritan Bennet Infant Star 500 (page 186)
- Nellcor Puritan Bennet Infant Star 950 (page 186)
- Nellcor Puritan Bennet pb7200 (page 187)
- Sechrist 600APM (page 188)
- Siemens SC 9000 (page 188)
- Servo 300 (page 190)
- Siemens Servo 900 (page 190)

Allied Health Care Bear 1000

Parametric data for this device is supplied by Table 1.

Table 1: Parametric Data - Allied Health Care Bear 1000

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
plateau pressure	PMS_PLATEAUPR_P
mean airway pressure	PMS_MEANAIRPR_P
sensitivity	PMS_SENSPRES_S
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME
inspiration hold time	PMS_PAUSETIME_S
positive pressure support	PMS_PRESSUP_S
inspiratory time	PMS_INSPTIME_S
Ti:Te ratio denominator	PMS_IERATIO_P
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S

Baxter Vigilance

Parametric data for this device is supplied by Table 2.

Table 2: Parametric Data - Baxter Vigilance

Parameter Description	PMS Item
signal quality index	-
SvO2	PMS_SvO2
stroke volume resistance	PMS_CCO_SVR
stroke volume resistance index	PMS_CCO_SVRI
bolus cardiac output	PMS_CCO_CO
bolus cardiac output index	PMS_CCO_CI
continuous cardiac output	PMS_CCO_CCO

Table 2: Parametric Data - Baxter Vigilance

Parameter Description	PMS Item
continuous cardiac output index	PMS_CCO_CCI
blood temperature	PMS_CCO_BLOODT

Bird VIP

Parametric data for this device is supplied by Table 3.

Table 3: Parametric Data - Bird VIP

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
sensitivity	PMS_SENSPRES_S
positive end-expiratory pressure	PMS_PEEPCPAP_S
hi rate alarm limit	PMS_HIRESPRLMT_S
lo peep alarm limit	PMS_LOPEEPLMT_S
lo pressure alarm limit	PMS_LOINSPRLMT_S
lo exhaled min. vol. alarm limit	PMS_LOEXMINLMT_S
lo exhaled tidal vol. alarm limit	PMS_LOEXTVLMT_S
secondary mode of operation	2ND_VENTMODE_S
positive pressure support	PMS_PRESSUP_S
inspiratory time	PMS_INSPTIME_S
Ti:Te ratio denominator	PMS_IERATIO_P
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
apnea time alarm limit	-
tidal volume setting	PMS_TIDALVOLUME_S
measured inspiratory time	PMS_INSP_MEAS
measured peep	PMS_MEAS_PEEP

Datex Capnomac

Parametric data for this device is supplied by Table 4.

Table 4: Parametric Data - Datex Capnomac

Parameter Description	PMS Item
expired sevoflurane	
inspired sevoflurane	
expired desflurane	
inspired desflurane	
expired isoflurane	
inspired isoflurane	
expired halothane	
inspired halothane	
expired N2O	
inspired N2O	
expired CO2	PMS_ETCO2
inspired CO2	PMS_IMCO2
expired O2	PMS_OXYGEN_EXP
inspired O2	PMS_OXYGEN_INSP
expired enflurane	
inspired enflurane	

Dräger Babylog 8000

Parametric data for this device is supplied by Table 5

Table 5: Parametric Data - Dräger Babylog 8000

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S

Table 5: Parametric Data - Dräger Babylog 8000

Parameter Description	PMS Item
minute volume	PMS_MINUTEVOLUME
lo exhaled minute volume alarm limit	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
inspiratory time	PMS_INSPTIME_S
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
apnea time alarm limit	-
pressure control pressure setting	PMS_CONTPRES_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
fraction of inspired oxygen setting	PMS_FIO2_S
measured peep	PMS_MEAS_PEEP
secondary mode of operation	2ND_VENTMODE_S
primary mode of operation	PMS_VENTMODE_S

Dräger Cato

Parametric data for this device is supplied by Table 6

Table 6: Parametric Data - Dräger Cato

Parameter Description	PMS Item
expired O2	PMS_OXYGEN_EXP
inspired O2	PMS_OXYGEN_INSP
expired CO2	PMS_ETCO2
inspired CO2	PMS_IMCO2
CO2-derived respiration rate	PMS_ETCO2RESP
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
plateau pressure	PMS_PLATEAUPR_P
mean airway pressure	PMS_MEANAIRPR_P
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME

Table 6: Parametric Data - Dräger Cato

Parameter Description	PMS Item
hi peak insp pressure alarm limit	PMS_HIPRESLMT_S
lo pressure alarm limit	PMS_LOINSPRLMT_S
lo exhaled minute volume alarm lim	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
secondary mode of operation	2ND_VENTMODE_S
inspiratory percent	PMS_INSP_PCT
ventilator rate	PMS_RESP_S
primary mode of operation	PMS_VENTMODE_S
tidal volume setting	PMS_TIDALVOLUME_S
pressure control pressure setting	PMS_CONTPRES_S
compliance	PMS_CMP
measured peep	PMS_MEAS_PEEP

Dräger Evita

Parametric data for this device is supplied by Table 7

Table 7: Parametric Data - Dräger Evita

Parameter Description	PMS Item
hi rate alarm limit	PMS_HIRESPRLMT_S
intrinsic peep	PMS_INTRIN_PEEP
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
plateau pressure	PMS_PLATEAUPR_P
mean airway pressure	PMS_MEANAIRPR_P
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S
minute volume	PMS_MINUTEVOLUME
lo exhaled minute volume alarm limit	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
positive pressure support	PMS_PRESSUP_S

Table 7: Parametric Data - Dräger Evita

Parameter Description	PMS Item
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
apnea time alarm limit	-
spontaneous minute volume	PMS_SPONMINVOL_P
tidal volume setting	PMS_TIDALVOLUME_S
pressure control pressure setting	PMS_CONTPRES_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
flow trigger setting	PMS_FLOW_TRIGGER
fraction of inspired oxygen setting	PMS_FIO2_S
ASB ramp time	PMS_ASB_RAMP
APRV high time	PMS_APRV_HI_TIME
compliance	PMS_CMP
resistance	PMS_RE
measured peep	PMS_MEAS_PEEP
spontaneous respiration rate	PMS_RESP_SPONT
APRV low pressure	PMS_APRV_LO_PRES
APRV high pressure	PMS_APRV_HI_PRES
APRV low time	PMS_APRV_LO_TIME
secondary mode of operation	2ND_VENTMODE_S
primary mode of operation	PMS_VENTMODE_S

Dräger Evita 2

Parametric data for this device is supplied by Table 8

Table 8: Parametric Data - Dräger Evita 2

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
peak pressure	PMS_PEAKINSPIRP
tidal volume	PMS_TIDALVOLUME
fraction of inspired oxygen	PMS_FIO2
minute volume	PMS_MINUTEVOLUME

Table 8: Parametric Data - Dräger Evita 2

Parameter Description	PMS Item
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
plateau pressure	PMS_PLATEAUPR_P
ventilator rate	PMS_RESP_S
compliance	PMS_CMP
resistance	PMS_RE
Ti:Te ratio denominator setting	PMS_IERATIO_S
flow rate	PMS_PEAKINSPFL_S
tidal volume setting	PMS_TIDALVOLUME_S
measured peep	PMS_MEAS_PEEP
pressure control pressure setting	PMS_CONTPRES_S
flow trigger setting	PMS_FLOW_TRIGGER
spontaneous minute volume	PMS_SPONMINVOL_P
positive pressure support	PMS_PRESSUP_S
fraction of inspired oxygen setting	PMS_FIO2_S
ASB ramp time	PMS_ASB_RAMP
APRV low pressure	PMS_APRV_LO_PRES
APRV high pressure	PMS_APRV_HI_PRES
APRV low time	PMS_APRV_LO_TIME
APRV high time	PMS_APRV_HI_TIME
spontaneous respiration rate	PMS_RESP_SPONT
intrinsic peep	PMS_INTRIN_PEEP
hi rate alarm limit	PMS_HIRESPRLMT_S
lo exhaled minute volume alarm limit	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
apnea time alarm limit	-
expired CO2	PMS_ETCO2
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S

Dräger Evita 2 Dura

Parametric data for this device is supplied by Table 9

Table 9: Parametric Data - Dräger Evita 2 Dura

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
peak pressure	PMS_PEAKINSPIRP
tidal volume	PMS_TIDALVOLUME
fraction of inspired oxygen	PMS_FIO2
minute volume	PMS_MINUTEVOLUME
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
plateau pressure	PMS_PLATEAUPR_P
ventilator rate	PMS_RESP_S
compliance	PMS_CMP
resistance	PMS_RE
Ti:Te ratio denominator setting	PMS_IERATIO_S
flow rate	PMS_PEAKINSPFL_S
tidal volume setting	PMS_TIDALVOLUME_S
measured peep	PMS_MEAS_PEEP
pressure control pressure setting	PMS_CONTPRES_S
flow trigger setting	PMS_FLOW_TRIGGER
spontaneous minute volume	PMS_SPONMINVOL_P
positive pressure support	PMS_PRESSUP_S
fraction of inspired oxygen setting	PMS_FIO2_S
ASB ramp time	PMS_ASB_RAMP
APRV low pressure	PMS_APRV_LO_PRES
APRV high pressure	PMS_APRV_HI_PRES
APRV low time	PMS_APRV_LO_TIME
APRV high time	PMS_APRV_HI_TIME
spontaneous respiration rate	PMS_RESP_SPONT
intrinsic peep	PMS_INTRIN_PEEP
hi rate alarm limit	PMS_HIRESPRLMT_S

Table 9: Parametric Data - Dräger Evita 2 Dura

Parameter Description	PMS Item
lo exhaled minute volume alarm limit	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
apnea time alarm limit	-
hi tidal volume alarm limit	-
inspiratory time	PMS_INSPTIME_S
expired CO2	PMS_ETCO2
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S

Dräger Evita 4

Parametric data for this device is supplied by Table 10

Table 10: Parametric Data - Dräger Evita 4

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
peak pressure	PMS_PEAKINSPIRP
tidal volume	PMS_TIDALVOLUME
fraction of inspired oxygen	PMS_FIO2
minute volume	PMS_MINUTEVOLUME
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
plateau pressure	PMS_PLATEAUPR_P
ventilator rate	PMS_RESP_S
compliance	PMS_CMP
resistance	PMS_RE
Ti:Te ratio denominator setting	PMS_IERATIO_S
flow rate	PMS_PEAKINSPFL_S
tidal volume setting	PMS_TIDALVOLUME_S
measured peep	PMS_MEAS_PEEP
pressure control pressure setting	PMS_CONTPRES_S
flow trigger setting	PMS_FLOW_TRIGGER

Table 10: Parametric Data - Dräger Evita 4

Parameter Description	PMS Item
spontaneous minute volume	PMS_SPONMINVOL_P
positive pressure support	PMS_PRESSUP_S
fraction of inspired oxygen setting	PMS_FIO2_S
ASB ramp time	PMS_ASB_RAMP
APRV low pressure	PMS_APRV_LO_PRES
APRV high pressure	PMS_APRV_HI_PRES
APRV low time	PMS_APRV_LO_TIME
APRV high time	PMS_APRV_HI_TIME
spontaneous respiration rate	PMS_RESP_SPONT
intrinsic peep	PMS_INTRIN_PEEP
hi rate alarm limit	PMS_HIRESPRLMT_S
lo exhaled minute volume alarm limit	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-
apnea time alarm limit	-
hi tidal volume alarm limit	-
inspiratory time	PMS_INSPTIME_S
expired CO2	PMS_ETCO2
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S

Dräger Julian

Parametric data for this device is supplied by Table 11

Table 11: Parametric Data - Dräger Julian

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME
fraction of inspired oxygen	PMS_FIO2
fraction of inspired oxygen setting	PMS_FIO2_S
ventilator rate	PMS_RESP_S
plateau pressure	PMS_PLATEAUPR_P

Table 11: Parametric Data - Dräger Julian

Parameter Description	PMS Item
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
tidal volume	PMS_TIDALVOLUME
tidal volume setting	PMS_TIDALVOLUME_S
flow rate	PMS_PEAKINSPFL_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
pressure control pressure setting	PMS_CONTPRES_S
measured peep	PMS_MEAS_PEEP
compliance	PMS_CMP
inspired O2	PMS_OXYGEN_INSP
expired O2	PMS_OXYGEN_EXP
CO2-derived respiration rate	PMS_ETCO2RESP
inspired CO2	PMS_IMCO2
expired CO2	PMS_ETCO2
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S
hi peak insp pressure alarm limit	PMS_HIPRESLMT_S
lo pressure alarm limit	PMS_LOINSPRLMT_S
lo exhaled minute volume alarm lim	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-

Dräger PM8060

Parametric data for this device is supplied by Table 12

Table 12: Parametric Data - Dräger PM8060

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME
fraction of inspired oxygen	PMS_FIO2
plateau pressure	PMS_PLATEAUPR_P
peak pressure	PMS_PEAKINSPIRP

Table 12: Parametric Data - Dräger PM8060

Parameter Description	PMS Item
mean airway pressure	PMS_MEANAIRPR_P
tidal volume	PMS_TIDALVOLUME
measured peep	PMS_MEAS_PEEP
compliance	PMS_CMP
inspired O2	PMS_OXYGEN_INSP
expired O2	PMS_OXYGEN_EXP
CO2-derived respiration rate	PMS_ETCO2RESP
inspired CO2	PMS_IMCO2
expired CO2	PMS_ETCO2
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S
hi peak insp pressure alarm limit	PMS_HIPRESLMT_S
lo pressure alarm limit	PMS_LOINSPRLMT_S
lo exhaled minute volume alarm lim	PMS_LOEXMINLMT_S
hi minute volume alarm limit	-

Engstrom Elsa

Parametric data for this device is supplied by Table 13

Table 13: Parametric Data - Engstrom Elsa

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
peak pressure	PMS_PEAKINSPIRP
tidal volume	PMS_TIDALVOLUME
fraction of inspired oxygen	PMS_FIO2
minute volume	PMS_MINUTEVOLUME
positive end-expiratory pressure	PMS_PEEPCPAP_S
ventilator rate	PMS_RESP_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
expired sevoflurane	
inspired sevoflurane	

Table 13: Parametric Data - Engstrom Elsa

Parameter Description	PMS Item
expired desflurane	
inspired desflurane	
expired isoflurane	
inspired isoflurane	
expired halothane	
inspired halothane	
expired N2O	
inspired N2O	
expired CO2	PMS_ETCO2
inspired CO2	PMS_IMCO2
primary mode of operation	PMS_VENTMODE_S

Hamilton Veolar

Parametric data for this device is supplied by Table 14

Table 14: Parametric Data - Hamilton Veolar

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S
minute volume	PMS_MINUTEVOLUME
fraction of inspired oxygen	PMS_FIO2
ventilator rate	PMS_RESP_S
tidal volume	PMS_TIDALVOLUME
plateau pressure	PMS_PLATEAUPR_P
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
sensitivity	PMS_SENSPRES_S
positive pressure support	PMS_PRESSUP_S
flow rate	PMS_PEAKINSPFL_S
inspiratory percent	PMS_INSP_PCT
Ti:Te ratio denominator	PMS_IERATIO_P

Table 14: Parametric Data - Hamilton Veolar

Parameter Description	PMS Item
measured peep	PMS_MEAS_PEEP
primary mode of operation	PMS_VENTMODE_S

Hellige SMU EVO

Parametric data for this device is supplied by Table 15

Table 15: Parametric Data - Hellige SMU EVO

Parameter Description	PMS Item
ECG heart rate	PMS_HR
ECG PVC count for the last minute	PMS_VPB
resp. rate	PMS_RESP
BP mean	
BP systolic	
BP diastolic	
PA wedge pressure (episodic)	
wedge pressure time stamp	
NBP mean	PMS_NBPMEA
NBP systolic	PMS_NBPSYS
NBP diastolic	PMS_NBPDIA
NBP time stamp	-
SpO2 saturation	
SpO2 rate	
temperature site 1	
temperature site 2	
blood temperature	PMS_BLOODT
Instantaneous cardiac output	-
time stamp of last CO (UNIX_TIME)	-
inspired CO2	PMS_IMCO2
expired CO2	PMS_ETCO2
inspired O2	
expired O2	

Table 15: Parametric Data - Hellige SMU EVO

Parameter Description	PMS Item
inspired Halothane	
expired Halothane	
inspired Enflurane	
expired Enflurane	
inspired Isoflurane	
expired Isoflurane	
inspired N2O	
expired N2O	
PtcCO2	PMS_TCO2M_PTCO2
PtcO2	PMS_TCO2M_PTO2
total heater power	PMS_TCO2M_POWER

Nellcor Puritan Bennet Adult Star 950 / 1500 / 2000

Parametric data for this device is supplied by Table 16

Table 16: Parametric Data - Nellcor Puritan Bennet Adult Star 950 / 1500 / 2000

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
plateau pressure	PMS_PLATEAUPR_P
mean airway pressure	PMS_MEANAIRPR_P
sensitivity	PMS_SENSPRES_S
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S
minute volume	PMS_MINUTEVOLUME
inspiration hold time	PMS_PAUSETIME_S
secondary mode of operation	2ND_VENTMODE_S
positive pressure support	PMS_PRESSUP_S
inspiratory time	PMS_INSPTIME_S
Ti:Te ratio denominator	PMS_IERATIO_P

Table 16: Parametric Data - Nellcor Puritan Bennet Adult Star 950 / 1500 / 2000

Parameter Description	PMS Item
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
spontaneous minute volume	PMS_SPONMINVOL_P
tidal volume setting	PMS_TIDALVOLUME_S
pressure control pressure setting	PMS_CONTPRES_S

Nellcor Puritan Bennet Infant Star

Parametric data for this device is supplied by Table 17

Table 17: Parametric Data - Nellcor Puritan Bennet Infant Star

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
inspiratory time	PMS_INSPTIME_S
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
secondary mode of operation	2ND_VENTMODE_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
HFV flow setting	PMS_HF_FLOW
HFV rate setting	PMS_HF_RR
HFV peak-to-peak pressure setting	PMS_HF_PRES

Nellcor Puritan Bennet Infant Star 500

Parametric data for this device is supplied by Table 18

Table 18: Parametric Data - Nellcor Puritan Bennet Infant Star 500

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
inspiratory time	PMS_INSPTIME_S
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
Ti:Te ratio denominator setting	PMS_IERATIO_S

Nellcor Puritan Bennet Infant Star 950

Parametric data for this device is supplied by Table 19

Table 19: Parametric Data - Nellcor Puritan Bennet Infant Star 950

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
positive end-expiratory pressure	PMS_PEEPCPAP_S
secondary mode of operation	2ND_VENTMODE_S
inspiratory time	PMS_INSPTIME_S
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
HFV flow setting	PMS_HF_FLOW
HFV rate setting	PMS_HF_RR
HFV peak-to-peak pressure setting	PMS_HF_PRES

Nellcor Puritan Bennet pb7200

Parametric data for this device is supplied by Table 20

Table 20: Parametric Data - Nellcor Puritan Bennet pb7200

Parameter Description	PMS Item
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
peak pressure	PMS_PEAKINSPIRP
plateau pressure	PMS_PLATEAUPR_P
mean airway pressure	PMS_MEANAIRPR_P
sensitivity	PMS_SENSPRES_S
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S
minute volume	PMS_MINUTEVOLUME
hi rate alarm limit	PMS_HIRESPRLMT_S
lo peep alarm limit	PMS_LOPEEPLMT_S
hi peak inspiratory pres. alarm limit	PMS_HIPRESLMT_S
lo pressure alarm limit	PMS_LOINSPRLMT_S
lo exhaled min. vol. alarm limit	PMS_LOEXMINLMT_S
lo exhaled tidal vol. alarm limit	PMS_LOEXTVLMT_S
inspiration hold time	PMS_PAUSETIME_S
positive pressure support	PMS_PRESSUP_S
inspiratory time	PMS_INSPTIME_S
Ti:Te ratio denominator	PMS_IERATIO_P
ventilator rate	PMS_RESP_S
flow rate	PMS_PEAKINSPFL_S
primary mode of operation	PMS_VENTMODE_S
spontaneous minute volume	PMS_SPONMINVOL_P
tidal volume setting	PMS_TIDALVOLUME_S
pressure control pressure setting	PMS_CONTPRES_S
Ti:Te ratio denominator setting	PMS_IERATIO_S
base flow setting	PMS_BASEFLOW_S
flow trigger setting	PMS_FLOW_TRIGGER

Table 20: Parametric Data - Nellcor Puritan Bennet pb7200

Parameter Description	PMS Item
static resistance	PMS_STATLUNGR_P
dynamic compliance	PMS_DYNLUNGC_P
dynamic resistance	PMS_DYNLUNGR_P
total peep	PMS_PEEP_P
auto peep	PMS_AUTO_PEEP
static compliance	PMS_STATLUNGC_P

Sechrist 600APM

Parametric data for this device is supplied by Table 21

Table 21: Parametric Data - Sechrist 600APM

Parameter Description	PMS Item
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P
respiratory rate	PMS_RESP2
positive end-expiratory pressure	PMS_PEEPCPAP_S
inspiratory time	PMS_INSPTIME_S
Ti:Te ratio denominator	PMS_IERATIO_P
primary mode of operation	PMS_VENTMODE_S

Siemens SC 9000

Parametric data for this device is supplied by Table 22

Table 22: Parametric Data - Siemens SC 9000

Parameter Description	PMS Item
ECG heart rate	PMS_HR
ECG PVC count for the last minute	PMS_VPB
ECG lead 1 ST	
ECG lead 2 ST	
ECG lead 3 ST	
ECG lead V ST	

Table 22: Parametric Data - Siemens SC 9000

Parameter Description	PMS Item
ECG lead Vp ST	
ECG lead AVR ST	
ECG lead AVL ST	
ECG lead AVF ST	
Resp rate	
bp mean	
bp systolic	
bp diastolic	
pa wedge pressure (episodic)	
Wedge pressure time stamp	
nbp mean	PMS_NBPMEA
nbp systolic	PMS_NBPSYS
NBP diastolic	PMS_NBPDIA
NBP time stamp	
spo2 saturation	
spo2 rate	
temperature site 1	
temperature site 2	
delta temp	
svo2 saturation	PMS_SvO2
saturation value for sao2	
blood temperature	
injectate temperature	PMS_TI
time stamp of the last CO	
last average CO reading	PMS_CO
inspired co2	PMS_IMCO2
expired co2	PMS_ETCO2
co2-derived respiration rate	PMS_ETCO2RESP

Servo 300

Parametric data for this device is supplied by Table 23

Table 23: Parametric Data - Servo 300

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
plateau pressure	PMS_PLATEAUPR_P
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P

Siemens Servo 900

Parametric data for this device is supplied by Table 24

Table 24: Parametric Data - Siemens Servo 900

Parameter Description	PMS Item
respiratory rate	PMS_RESP2
minute volume	PMS_MINUTEVOLUME
fraction of inspired oxygen	PMS_FIO2
tidal volume	PMS_TIDALVOLUME
plateau pressure	PMS_PLATEAUPR_P
peak pressure	PMS_PEAKINSPIRP
mean airway pressure	PMS_MEANAIRPR_P

Appendix E: QS Versions

The following table describes the various versions of the QS system and the operating systems that support them. See the notes at the end of the table for information on required servers for various versions.

Table 1: QS Versions as they Relate to Servers and Workstations

	Workstations				Servers				
Version	**OS/2**	**NT4**	**Windows 2000**	**XP**	**OS/2**	**NT4**	**Windows 2000**	**Windows 2003**	**Comments**
5.00.0	X				X	X			First version to support NT4 server
5010	X	X			X	X			First version to support NT4 workstation
5020	X	X			X	X			
5030	X	X			X	X			
5040	X	X			X	X			Last version that sold with WORM platters
5050	X	X			X	X			First version to support NT Archive and OBLink
5051	X	X			X	X			
5052	X	X			X	X			
5053	X	X			X	X			Last version to require OS/2 for print/fax
5060	X	X			X	X			First version to support an all NT system
5061	X	X	X		X	X			Last version to support OS/2
6000		X	X			X			HIPAA log support added
6010		X	X			X			
6050		X	X			X			EMEA only (Non-US) release
6600		X	X			X	X		First version to support Windows 2000 server (using Nero for Archive)
6605		X	X	X*		X	X		
6608		X	X	X		X	X		

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Table 1: QS Versions as they Relate to Servers and Workstations

	Workstations				Servers				
Version	**OS/2**	**NT4**	**Windows 2000**	**XP**	**OS/2**	**NT4**	**Windows 2000**	**Windows 2003**	**Comments**
6700		X	X	X			X	X	First version to support Windows 2003

* 6.60.0 can use XP with QS patch 02 or higher.

Notes on the versions:

- Versions 5.00.0 through 5.04.0 require at least one OS/2 machine for Print and Archive.
- Versions 5.05.0 through 5.05.3 require at least one OS/2 machine for Print.
- Versions 6.00.0 through 6.05.0 require NT4 Server.
- Version 6.70.5 requires a Microsoft Windows NT, Microsoft Windows 2000, or Microsoft Windows 2003 server.

Appendix F: QS & Other Documents

This appendix lists a number of additional publications that may help you in understanding and supporting the QS system. Unless noted otherwise, all publications mentioned here are in English.

QS Documentation

Table 1: QS Documentation

Title	Revision	Part Number
Archive Conversion Tool Manual	C	2002033-003
Birthlogs & Data Reports User Guide	C	2002033-017
Client Software Installation Info Sheet	A	DOC0071138
Configuration Reference Manual for System Managers	F	08046-002-QMI
Connection Manager Manual	C	2002033-007
CSE Customer Install Checklist	A	DOC0062882
Customer-Supplied Equipment Guide	A	2002033-045
HIPAA Reference Guide	A	2002033-009
Inbound Interface Specification (HIS & HL7)	E	08021-001-QMI
JCAHO Changes Guide	A	2002033-043
Outbound Interface Specification (HIS & HL7)	D	2006710-001
Patient Care Manual For System Managers & Users	E	2002033-006
Quick Start Configuration Guide	C	2002033-002
Surveillance Configuration Guide	E	2002033-020
Surveillance Only User Guide	B	2002033-018
Technical Hardware Specifications	A	DOC0067218

NOTE: Publications listed with their ISBN are issued by third-party publishers or vendors. GE neither makes nor implies any warranty regarding any of these publications or their associated products.

Microsoft Windows NT & Microsoft Windows 2000

- Microsoft Windows 2000 Professional MCSE Training Kit
  ISBN 1-57231-901-1

Networking

- Cisco Internetworking Technologies Handbook
  ISBN 1-58705-001-3
- Microsoft Encyclopedia of Networking
  ISBN 0-7356-0573-4

Appendix G: Citrix Support

The QS may now be run on the Citrix environment, thus enabling use of Citrix client for remote access to QS client and reducing overhead of maintaining multiple instances of QS client installed on many workstations within a hospital.

NOTE: OB Link remote access is not supported in Citrix.

Citrix 4.0 Presentation server is required to run with the QS 6.7.5 software.

The Citrix software installation, hardware and network infrastructure maintenance and service is the responsibility of the customer. There will be certain settings that will be required to make sure QS runs properly. This section explains each of the configuration requirements.

Customer Requirements

The customer will be responsible for the following:

- Installation and configuration of the Citrix software.
- Installation and configuration of Citrix clients ICA software or Win Term device (Microsoft Windows terminal device)
- Setting up the Internet Protocols (IPs) on the Citrix server - 1 per concurrent client connection.

  For more information, see “IPs and User Accounts” on page 198.
- Setting up the Citrix Users accounts on the Citrix server.

  For more information, see “IPs and User Accounts” on page 198.
- Providing both the above to the QSIC for QS Designer configuration
- During the installation of QS software on a Citrix server, the QSIC should be able to contact the customers Citrix expert.

System Requirements

Citrix 4.0 Presentation Server has the following requirements.

NOTE: This includes what is required to run QS.

Operating System

- Microsoft Windows 2000 SP 4 or later
- Microsoft Windows 2003

Software

- Terminal Services Component - Application Mode
- JRE 1.4.2_06 or later
- .Net Frame work 1.1
- Microsoft IIS service

Hardware

- Microsoft Windows 2000 Server
- CPU - P3
- CPU speed - 1 GHz or more
- RAM - 512 or more
- HD - 4 GB or more

NOTE: This is for Citrix and QS software only, it will need to scale depending on number of users accessing the Citrix server.

Microsoft Windows 2003 Server

- CPU - P3
- CPU speed - 1 GHz or more
- RAM - 512 or more
- HD - 4 GB or more

Network

As specified by Citrix - IMA Default ports will be TCP 2512 and 2513

These ports enable Citrix server communication. IMA runs as a service. The service will be automatically started when the server starts.

Documentation

Citrix 4.0 Presentation Server comes with online documentation. The documents contain details of installing, configuring and managing the Citrix servers.

These documents can be accessed by installing the manuals from the Citrix Presentation Server Components Disk (English Version 4.0)

1. Insert the Citrix Presentation Server Components Disk (English Version 4.0) into the CD-ROM Drive
2. The Citrix Meta Components Window will automatically display.

3. Select Install Document Center from the Citrix Meta Components Window.
4. Follow the Citrix install shield instructions to install the document interface to the server.

Once the Document Center is installed you can access Citrix Documents through the Start -> Programs -> Citrix -> Metaframe Presentation Server -> Documents menu item.

Some of the key documents that should be reviewed by the user are:

- Getting_Started.pdf
- Installation_Manager_Guide.pdf
- Licensing_Guide.pdf
- Administrators_Guide.pdf

Configuration

The Terminal Services Component service must be installed prior to installing Citrix Presentation Server.

It can be installed using Add / Remove components in the Control Panel.

Install using Application Server Mode.

Metaframe Access Suit Licensing Management will need to be installed to configure the Citrix Presentation Server license.

NOTE: On Microsoft Windows 2000 and Microsoft Windows 2003, Citrix does not recommend using the /3GB switch in the Boot.ini.

Notes

Some page numbers in this manual reference Citrix documents. Those documents are not under QS control and page numbers and document content can change at any time. For the latest Citrix documentation, see the Citrix Web site.

Citrix 4.0 Presentation server with QS was tested under a Single Farm, Single server environment using pass through authentication. QS sees no limitations for running it under a Multiple Farm configuration although it would require a high level of understanding on the Citrix Administrators side.

Citrix 4.0 Presentation server - server shadowing can be on or off.

IPs and User Accounts

While it is the customer's responsibility to configure the IP address of the Citrix server, these are the steps taken to add Citrix IP address for use with the QS software:

Create Virtual IPs

Add IP addresses to the terminal server adapter.

1. Open the Control Panel and double click **Network and Dialup Connections**.
2. Select the network adapter that will be used for the QS network.
3. Right-click the adapter and select **Properties**.
4. Select Internet Protocol (TCP/IP) and click **Properties**.
5. Click **Advanced**.
6. Click **Add** and enter an IP address and subnet mask that will be used for the terminal server clients.

   NOTE: This IP address cannot be used anywhere else on the network. This address should NOT correspond to the IP address of the terminal client machine(s).

   NOTE: You need to add a unique IP address for EACH Client instance that may be used. So if 30 simultaneous instances of QPM on the Citrix server then 30 IP's will need to be added. If you have 30 client terminals but only wish to run max 5 simultaneously then only 5 IPs will need to be added.

7. Click **Add**.

   Repeat the above steps for each terminal client connection purchased.

8. To close all dialogue boxes when complete, click **OK**.

Add and Configure Citrix Users

These are the steps taken to create Citrix users for use with the QS software:

Add Terminal Server Users (page 198)

Configure User Accounts (page 199)

Add Terminal Server Users

1. Open the Control Panel and double-click **Administrative Tools**.
2. Double-click **Computer Management**.
3. Open **Local Users and Groups**.

4. Open the **User** folder.
5. Click **Action** on the menu and select **New User**.
6. Enter username and password (example - QSTSUser1, QSTSUser2).

   NOTE: The customer will need to change the password to meet their local security policies.

7. For **Description**, enter **QS Terminal Client User**.
8. Clear **User must change password at next logon**.
9. Select **Password never expires**.
10. Click **Create**.

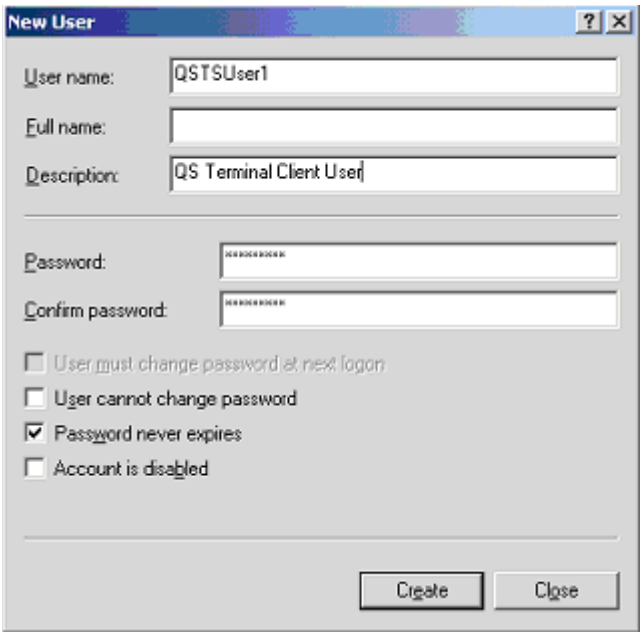

Figure G-1: Log On Dialog

Configure User Accounts

1. Create user directory by creating the following directory: <QSDRIVE>\TSUSERNAME (example- C:\QSTSUSER1).
2. Open the Control Panel and double-click **Administrative Tools**.
3. Double-click **Computer Management**.
4. Open **Local Users and Groups**.
5. Open the **User** folder.
6. Select user to modify.
7. Right-click the user name and select **Properties** from the menu.

8. Click the **Environment** tab.
9. Select the **Start the following program at logon** check box.
10. Enter QPM SLOWCONNECTION as Program File Name.
11. Enter <QS drive>\QS\EXE in Start In text box.

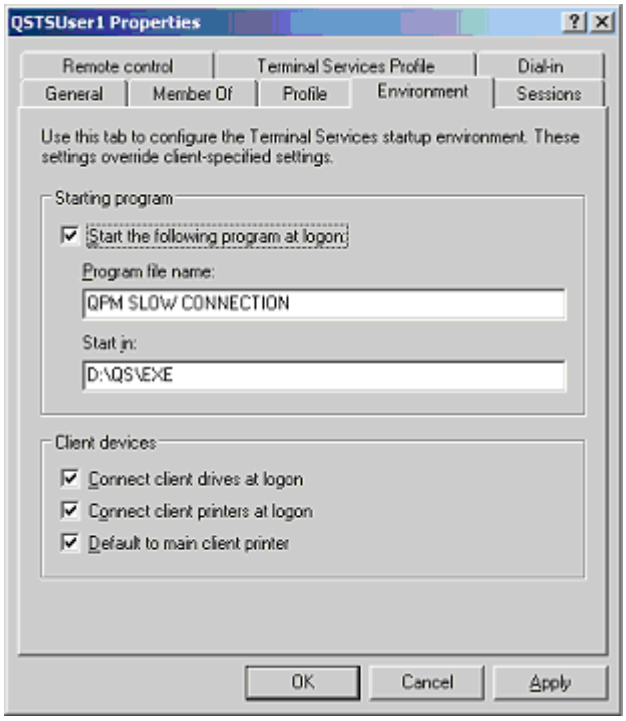

Figure G-2: QSTSUser 1 Properties Dialog - Environment

12. Click the **Sessions** tab.
13. Set End disconnected session: to 1 minute.

14. Set Allow reconnection: to From original client only.

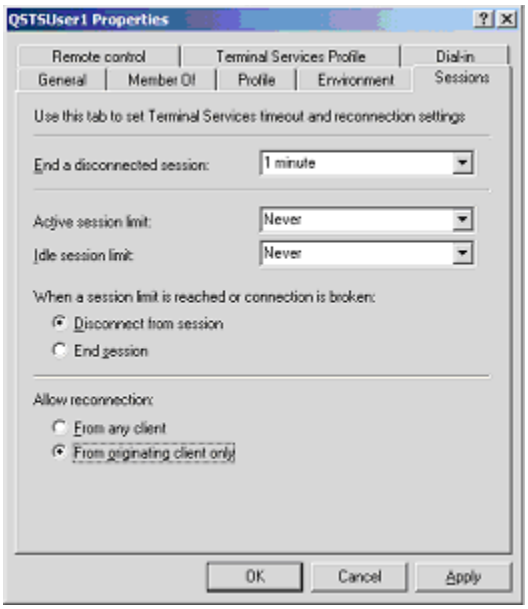

Figure G-3: QSTSUser 1 Properties Dialog - Sessions

15. Click the **Terminal Services Profile** tab.
16. Set Local Path to <QSDRIVE>\TSUSERNAME (example-C:\QSTSUSER1)

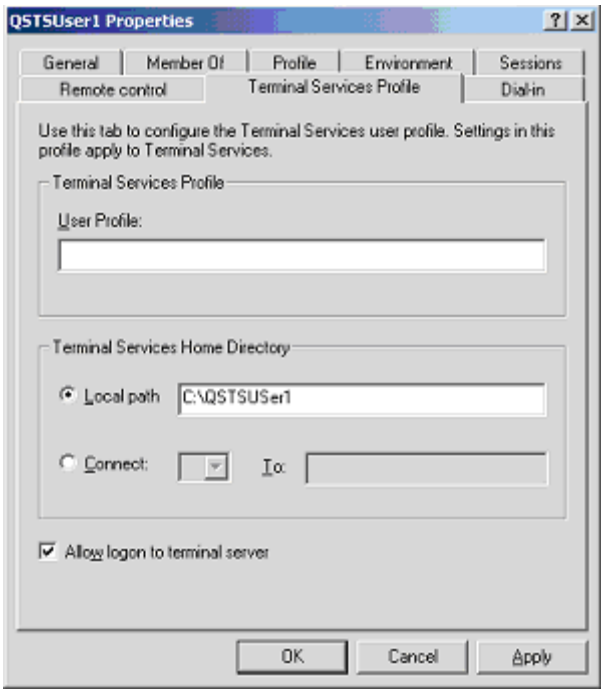

Figure G-4: QSTSUser 1 Properties Dialog - Terminal Services Profile

17. Click **OK**.

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